STARTING/CHARGING SYSTEMS(H4DO)

SC(H4DO)

1. General Description
2. Charging System
3. Starter
4. Starter Relay
5. Generator
6. Battery
7. Battery Cable Assembly
8. Battery Sensor

STARTING/CHARGING SYSTEMS(H4DO) > General Description

CAUTION

- When performing service operation, refer to “Repair Contents” in “General Description”. Ref. to REPAIR CONTENTS>Repair Contents.
- Prior to starting work, pay special attention to the following:
  1. Always wear work clothes, a work cap, and protective shoes. Additionally, wear a helmet, protective goggles, etc. if necessary.
  2. Protect the vehicle using a seat cover, fender cover, etc.
  3. Prepare the service tools, clean cloth, containers to catch grease and oil, etc.
- Prevent scattering of grease and oil. If it scatters, wipe it off immediately to prevent it from penetrating the floor or flowing out, to protect the environmental.
- If the grease and oil is spilt over the engine, exhaust pipe or the under cover, completely wipe it off to avoid emission of smoke or causing a fire.
- Vehicle components are extremely hot immediately after driving. Be wary of receiving burns from heated parts.
- When performing a repair, identify the cause of trouble and avoid unnecessary work.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground terminal from the battery sensor.
- Always use the jack-up point when the lifting device, shop jacks or rigid racks are used to support the vehicle.
- Before starting works, remove dirt and corrosion around the target area.
- Keep the removed parts in order and protect them from dust and dirt.
- All removed parts, if to be reused, should be reinstalled in the original positions with attention to the correct directions, etc.
- For the parts except for the non-reusable parts, replace then with new parts if necessary.
- Be sure to tighten bolts and nuts to the specified torque.

STARTING/CHARGING SYSTEMS(H4DO) > General Description

SPECIFICATION

1. STARTER

- AT model

Type			Reduction type
Model			438000-5410
Manufacturer			DENSO
Voltage and output			12 V — 1.6 kW
Direction of rotation			Counterclockwise (when observed from pinion)
Number of pinion teeth			13
Armature commutator runout	mm (in)	Standard	0.02 (0.0008)
		Limit	0.05 (0.0020)
Armature commutator diameter	mm (in)	Standard	29.0 (1.1417)
		Limit	28.0 (1.1024)

Armature depth of segment mold	mm (in)	Standard	0.70 (0.0276)
		Limit	0.20 (0.0079)
Brush length	mm (in)	Standard	14.4 (0.5669)
		Limit	9.0 (0.3543)
No-load characteristics		Voltage	11 V
		Current	90 A or less

- MT model

Type			Reduction type
Model			M000TD3371
Manufacturer			Mitsubishi Electric
Voltage and output			12 V — 1.0 kW
Direction of rotation			Counterclockwise (when observed from pinion)
Number of pinion teeth			11
Armature commutator runout	mm (in)	Standard	0.05 (0.0020)
		Limit	0.10 (0.0039)
Armature depth of segment mold	mm (in)	Standard	0.05 (0.0020)
Brush length	mm (in)	Standard	12.3 (0.4843)
		Limit	7.0 (0.2756)
Brush spring force	N (kgf, lbf)	Standard	15.9 — 19.5 (1.62 — 1.99, 3.54 — 4.38)
		Limit	2.5 (0.25, 0.56)
No-load characteristics		Voltage	11 V
		Current	95 A or less

2. GENERATOR

Type	Rotating-field three-phase type, voltage regulator built-in type, each with load response control system
Model	A5TV1581
Manufacturer	Mitsubishi Electric
Voltage and output	12 V — 150 A
Polarity on ground side	Negative
Direction of rotation	Clockwise (when observed from pulley side)
Stator connection	3-phase △ type
Output current	1,500 r/min — 44 A or more [13.5 V] 2,500 r/min — 121 A or more [13.5 V] 5,000 r/min — 148 A or more [13.5 V]
Regulated voltage	14.0 — 14.6 V [23°C (73°F)]

3. BATTERY

Type	55D23L	75D23L

Nominal capacity	5 HR: 40 Ah, 20HR: 48 Ah [25°C (77°F)]	5 HR: 53 Ah, 20HR: 62 Ah [25°C (77°F)]
Nominal voltage	12 V	12 V
CCA	390 A	470 A
BCI group number*	35	35

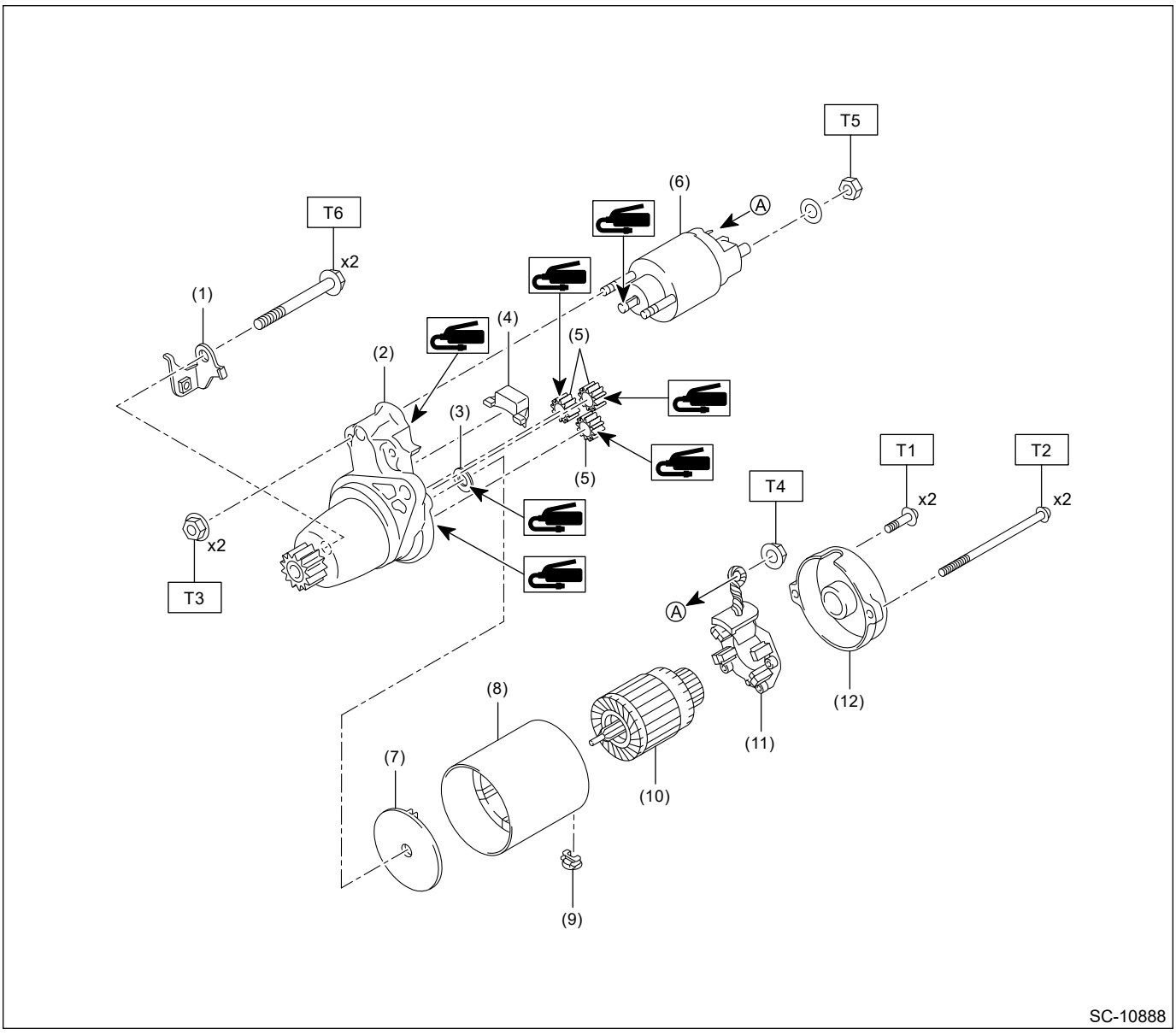
*: Use the information about the battery size as a reference. This information shall not be guaranteed by SUBARU CORPORATION.

STARTING/CHARGING SYSTEMS(H4DO) > General Description

COMPONENT

1. STARTER

- AT model

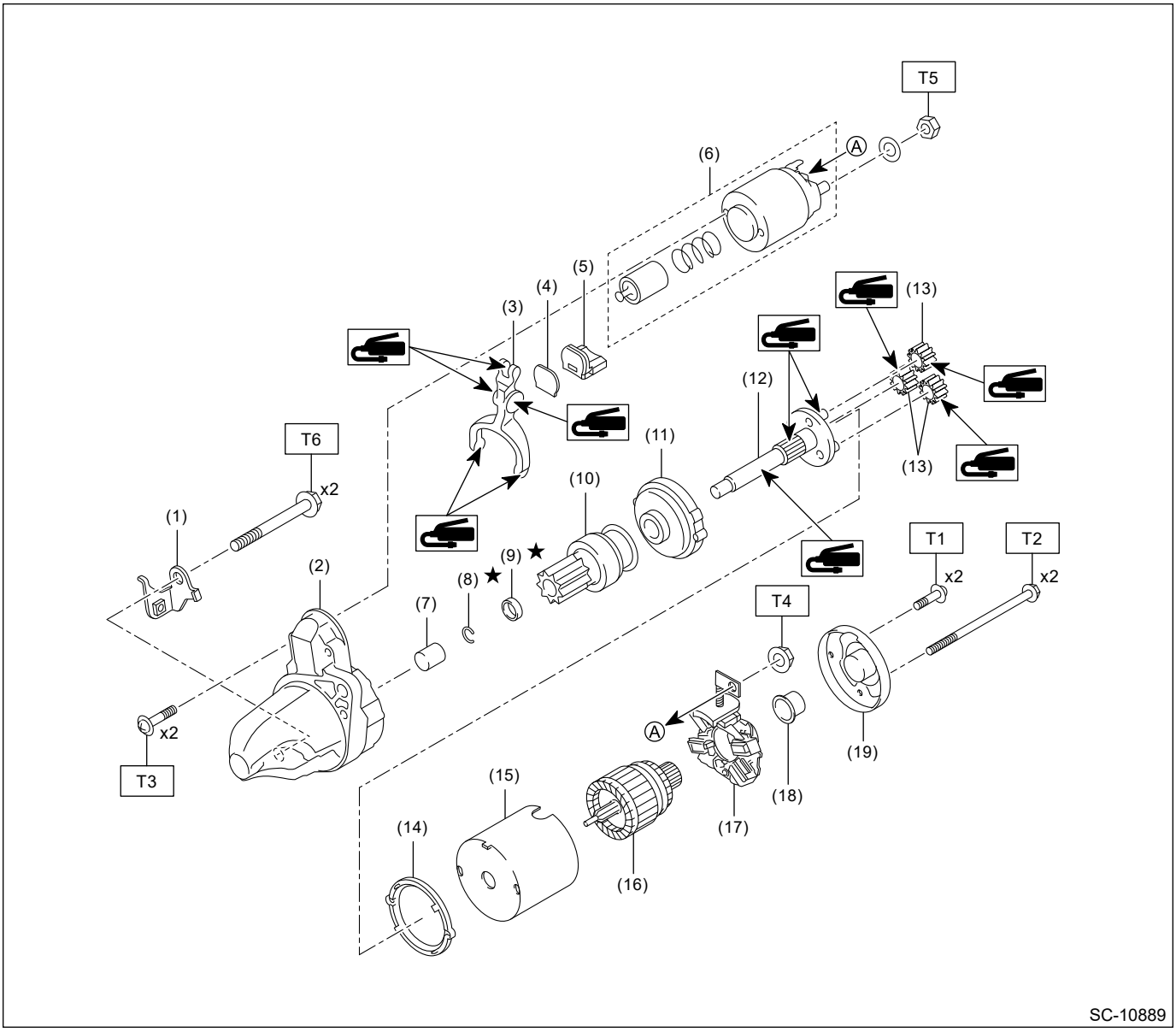


(1) Cable stay
(2) Starter drive housing ASSY
(3) Pinion stop washer
(4) Seal rubber
(5) Pinion gear
(6) Magnet switch ASSY
(7) Plate
(8) Yoke ASSY
(9) Drain duct
(10) Armature ASSY
(11) Brush holder ASSY
(12) Starter cover

Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.5 (0.2, 1.1)
T2: 6 (0.6, 4.4)
T3: 7.5 (0.8, 5.5)
T4: 10 (1.0, 7.4)
T5: 11 (1.1, 8.1)
T6: 50 (5.1, 36.9)

- MT model



(1) Cable stay
(2) Starter housing
(3) Shift lever
(4) Plate
(11) Internal gear
(12) Shaft
(13) Pinion gear
(14) Seal rubber

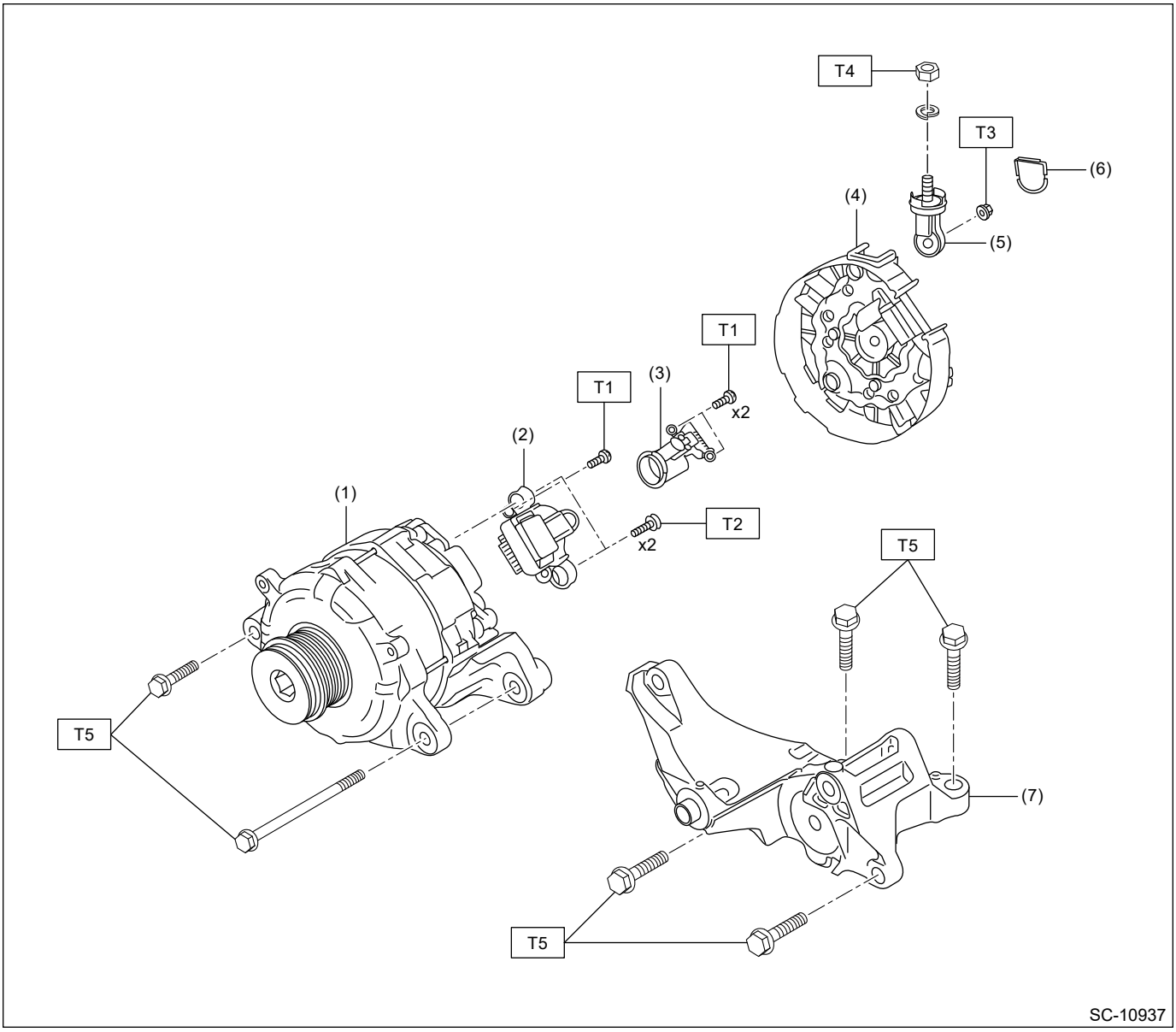
Tightening torque: N·m (kgf-m, ft-lb)

T1: 1.4 (0.1, 1.0)
T2: 6 (0.6, 4.4)
T3: 7.5 (0.8, 5.5)

(5) Seal rubber
(6) Magnet switch ASSY
(7) Sleeve bearing
(8) Snap ring
(9) Stopper
(10) Overrunning clutch
(15) Yoke ASSY
(16) Armature ASSY
(17) Brush holder ASSY
(18) Sleeve bearing
(19) Starter cover

T4: 10 (1.0, 7.4)
T5: 11 (1.1, 8.1)
T6: 50 (5.1, 36.9)

2. GENERATOR

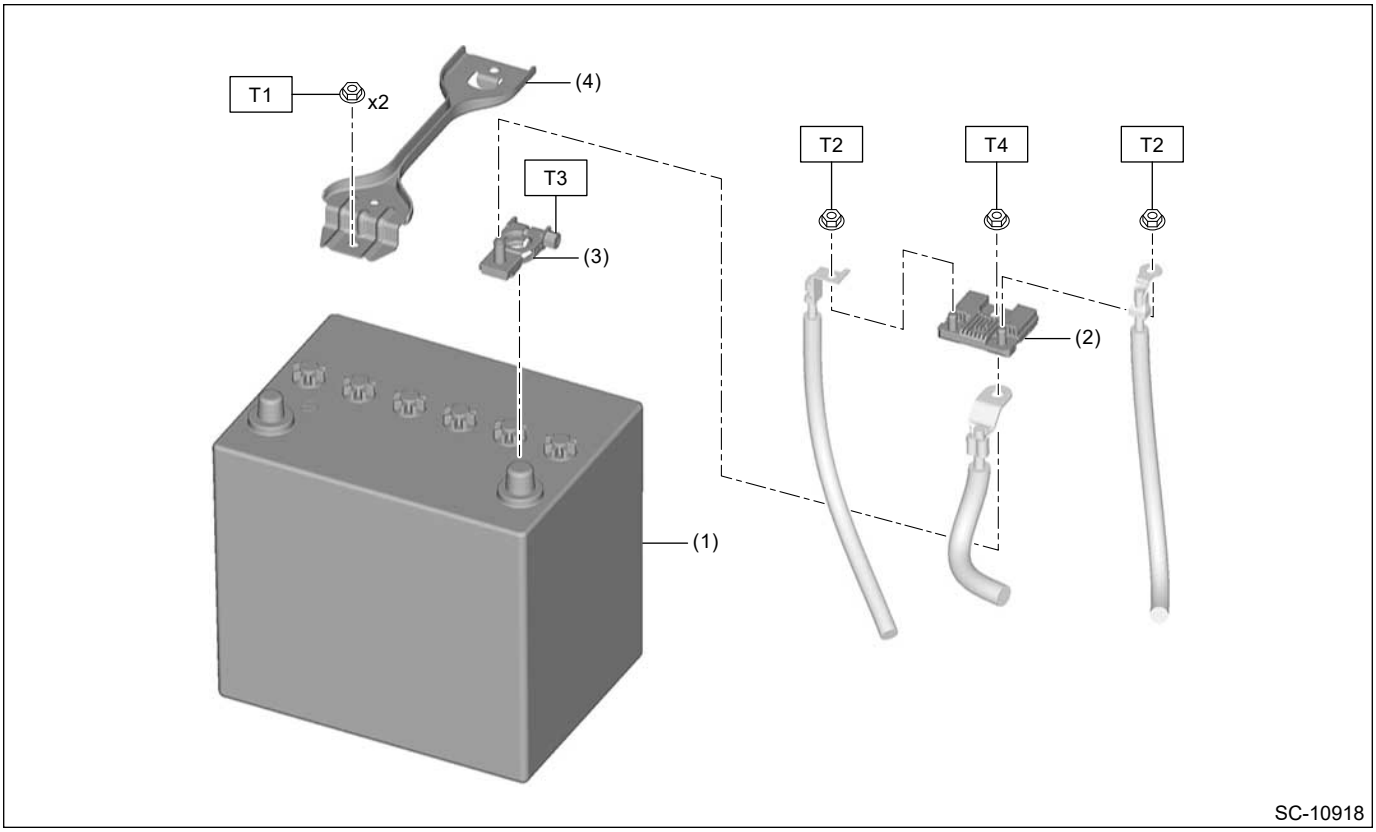


(1) Rotor & stator ASSY
(2) IC regulator
(3) Brush holder
(4) Rear cover
(5) Terminal B
(6) Cover
(7) Generator bracket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 2 (0.2, 1.5)
T2: 3.9 (0.4, 2.9)
T3: 8.9 (0.9, 6.6)
T4: 15.5 (1.6, 11.4)
T5: Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Generator>INSTALLATION.

3. BATTERY AND SLOW BLOW FUSE



(1) Battery

(2) Slow blow fuse

(3) Terminal base

(4) Battery holder

Tightening torque: N·m (kgf-m, ft-lb)

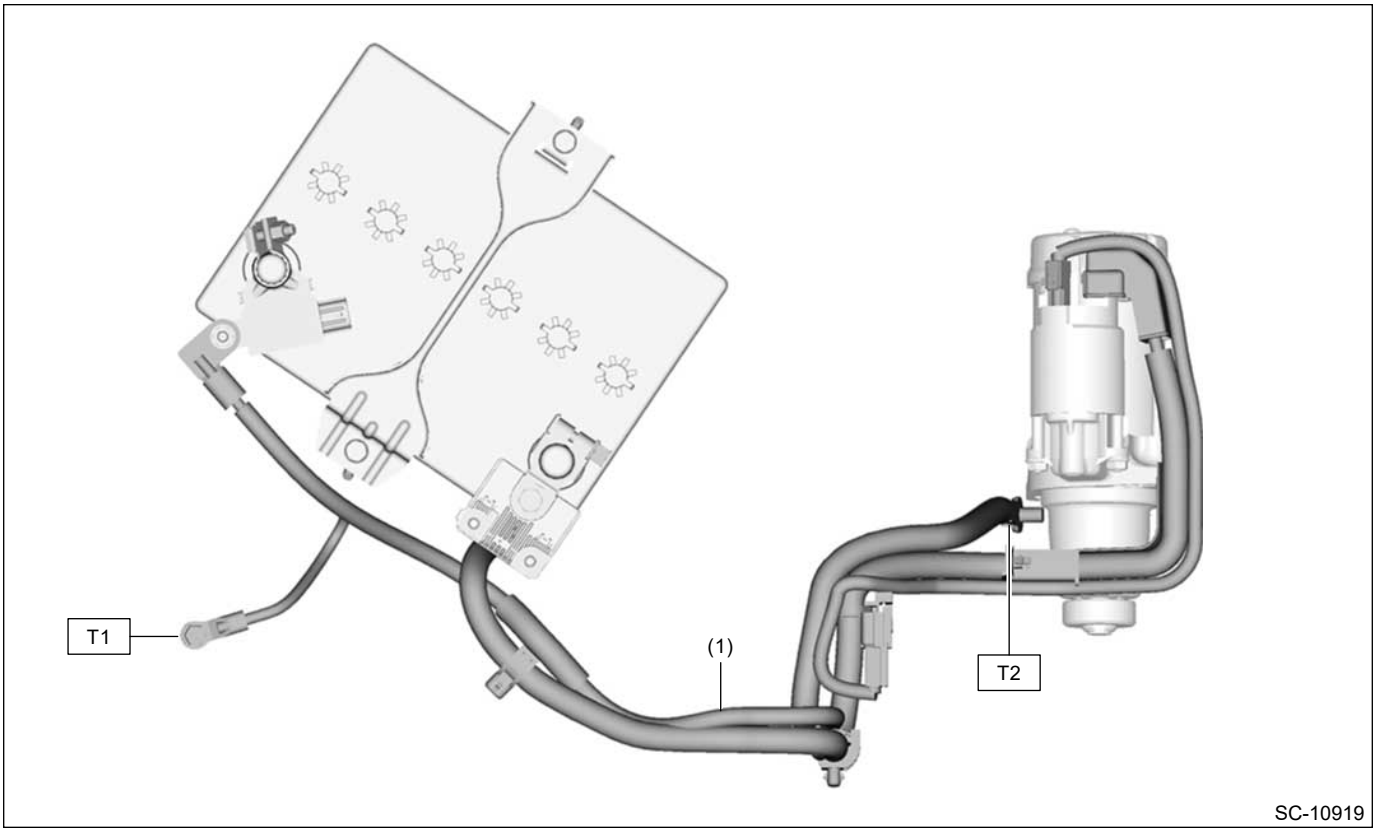
T1: 3.5 (0.4, 2.6)

T2: 5.5 (0.6, 4.1)

T3: 6 (0.6, 4.4)

T4: 7.5 (0.8, 5.5)

4. BATTERY CABLE ASSEMBLY



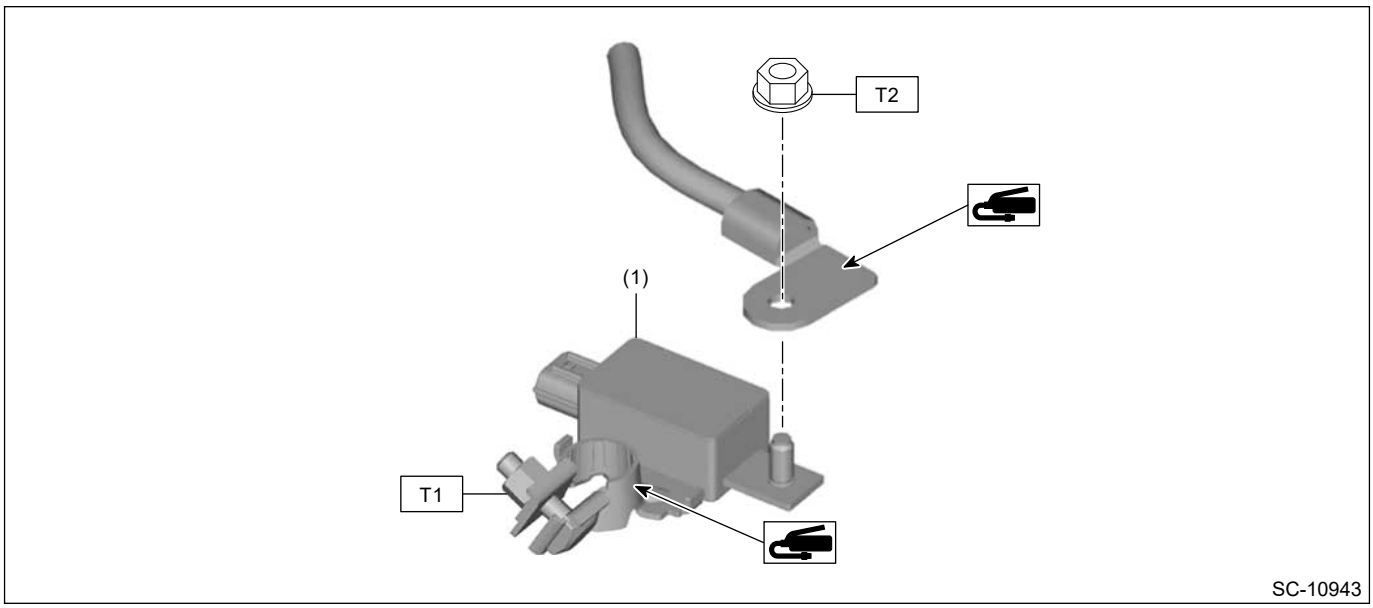
(1) Battery cable ASSY

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)

T2: 14 (1.4, 10.3)

5. BATTERY SENSOR



(1) Battery sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.4)
T2: 7.5 (0.8, 5.5)

STARTING/CHARGING SYSTEMS(H4DO) > General Description

PREPARATION TOOL

1. SUBARU SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 STSSM4	—	SUBARU SELECT MONITOR 4	Used for setting of each function and troubleshooting for electrical system. **Note:** • **For detailed operation procedures, refer to "Help" of application.** • **Used together with interface for Subaru Select Monitor (such as DST-i and DST-010).**

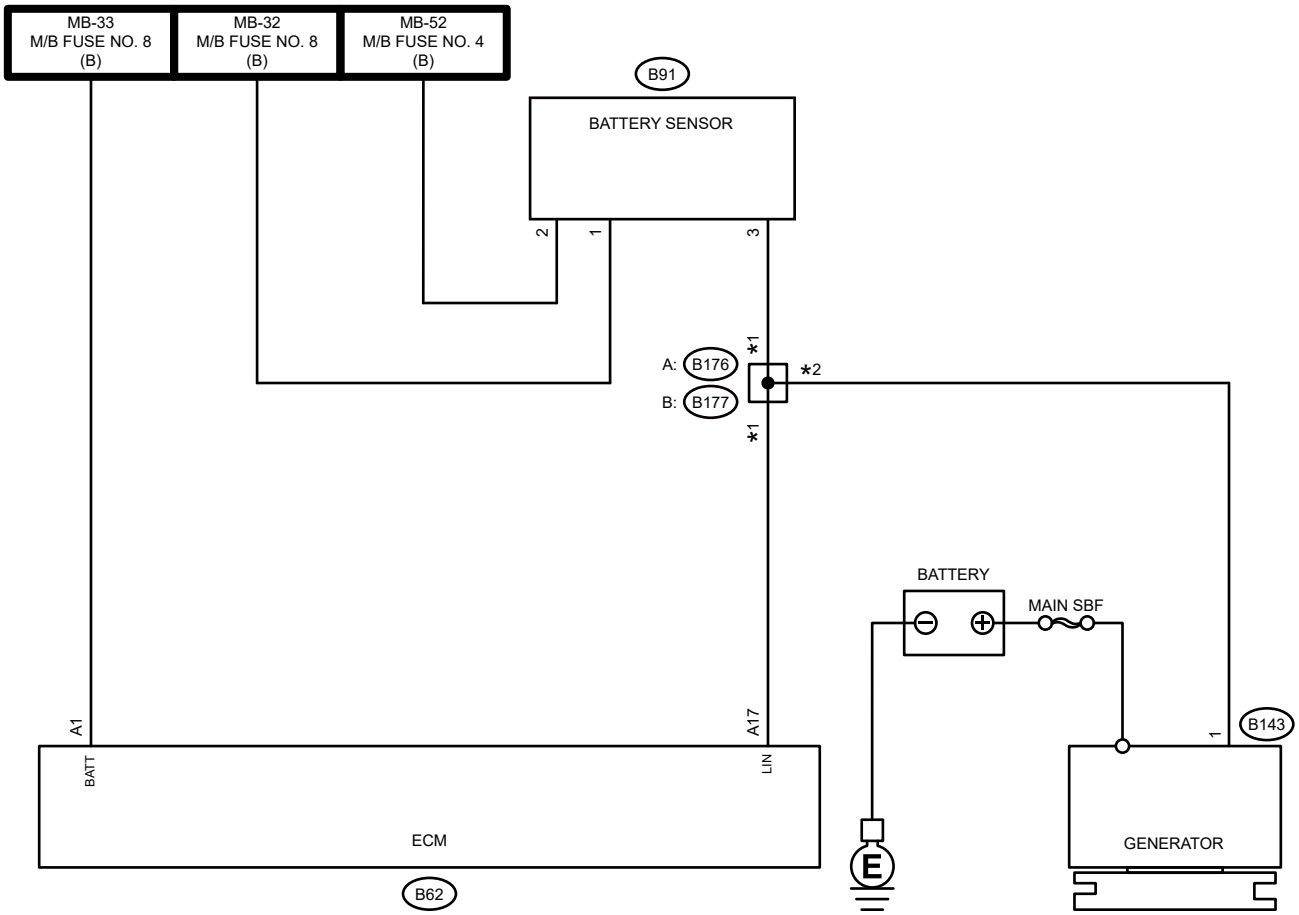
2. OTHER

	REMARKS
TORX® T25	Used for disassembling and assembling the starter. (AT model)
Circuit tester	Used for measuring resistance, voltage and current.

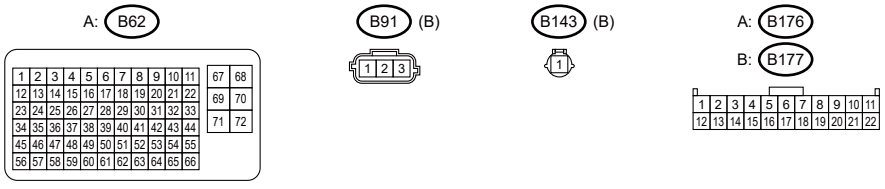
	REMARKS
	Note: • **When measuring the standby current, prepare a circuit tester which can measure down to 1 mA.** • **When measuring the standby current for models with keyless access function, prepare an analog type.**

STARTING/CHARGING SYSTEMS(H4DO) > Charging System

WIRING DIAGRAM



*1 : TERMINAL No. OPTIONAL ARRANGEMENT BETWEEN A8 AND A9
*2 : TERMINAL No. OPTIONAL ARRANGEMENT BETWEEN B3 AND B4



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STARTING/CHARGING SYSTEMS(H4DO) > Charging System

INSPECTION

Inspection when charge warning light illuminates

Note:
If the alternator overheats, the charge warning light illuminates temporarily.

1. CHECK DTC.

1. Turn the ignition switch to ON.
2. Using the Subaru Select Monitor, read all DTCs. Ref. to LAN SYSTEM (DIAGNOSTICS)>Diagnostic Trouble Code (DTC).

Is DTC detected?

Yes	Perform the diagnosis for the displayed DTCs.
No	Go to 2.

2. CHECK V-BELT.

Check the V-belt for abnormalities. Ref. to MECHANICAL(H4DO)>V-belt>INSPECTION.

Is the V-belt normal?

Yes	Go to 3.
No	Replace the V-belt, V-belt tensioner assembly or idler pulley. Ref. to MECHANICAL(H4DO)>V-belt.

3. CHECK VOLTAGE OF GENERATOR TERMINAL B.

Check the voltage of the generator terminal B.

Is the battery voltage applied?

Yes	Go to 4.
No	Repair the harness between generator and MAIN SBF.

4. CHECK CONTINUITY BETWEEN GENERATOR MAIN BODY AND CHASSIS GROUND.

Check continuity between generator main body and chassis ground.

Is there continuity?

Yes	Go to 5.
No	Check and repair the installation condition of the generator, chassis ground and engine ground. Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Generator.

5. CHECK COMBINATION METER.

Using the Subaru Select Monitor, perform the diagnosis of combination meter. Ref. to COMBINATION METER (DIAGNOSTICS)>Active Test.

Is the charge warning light OK?

Yes	Repair or replace the generator. Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Generator.
No	Replace the combination meter. Ref. to INSTRUMENTATION/DRIVER INFO>Combination Meter.

STARTING/CHARGING SYSTEMS(H4DO) > Starter

REMOVAL

1. Disconnect the ground terminal from battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.
2. Remove the center exhaust pipe. Ref. to EXHAUST(H4DO)>Center Exhaust Pipe>REMOVAL.

Note:
This procedure is necessary to use the torque wrench during the installation.

3. Disconnect the ground terminal.

Caution:
In order to prevent damaging the ground terminal, fix the ground terminal when loosing the bolt, and avoid the part from rotating together while loosening the bolt.

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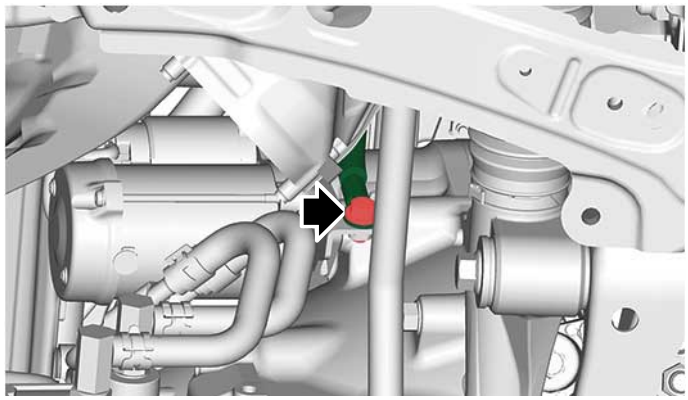

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4. Remove the bolt together with the cable stay.

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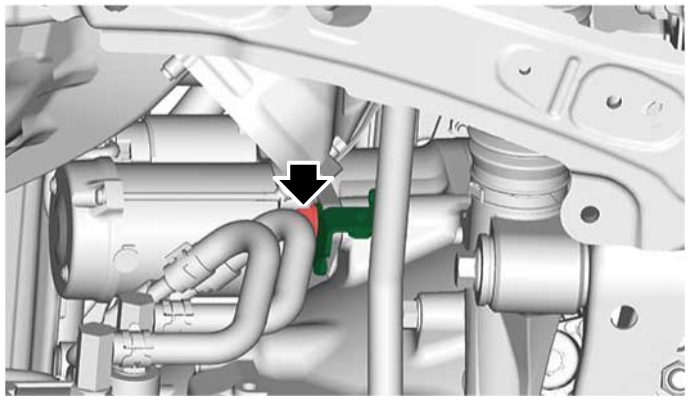

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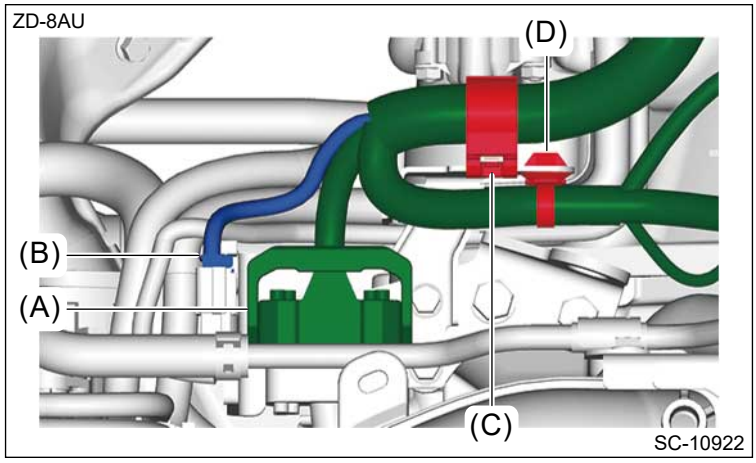
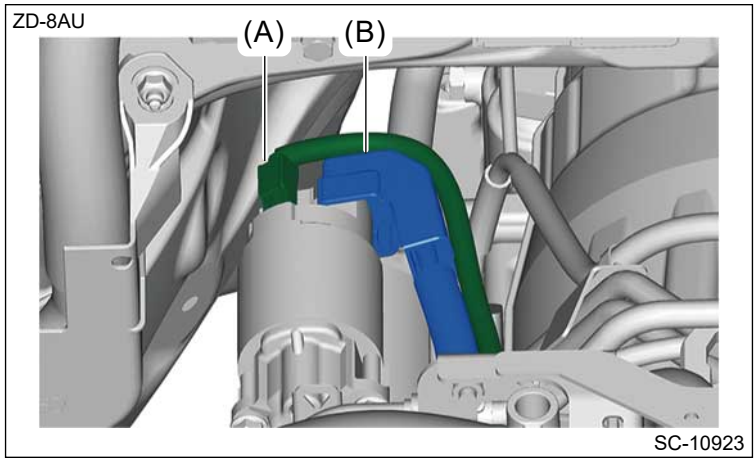
5. Lower the vehicle.
6. Remove the collector cover. Ref. to FUEL INJECTION (FUEL SYSTEMS)(H4DO)>Collector Cover>REMOVAL.
7. Remove the connector (A) and connector (B).

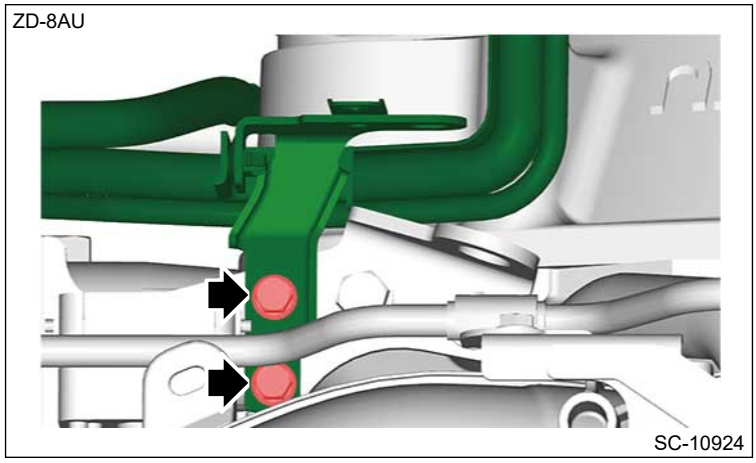
8. Remove the clip (C) and clip (D) securing the bulkhead wiring harness, and place it aside so that it does not interfere with work.



9. Disconnect the connector (A) and terminal B (B).



10. Remove the bolt securing the bracket to the engine rear hanger, and place the battery cable assembly aside so that it does not interfere with the work.



11. Remove the starter.

Note:
Remove from the upper side of the vehicle.

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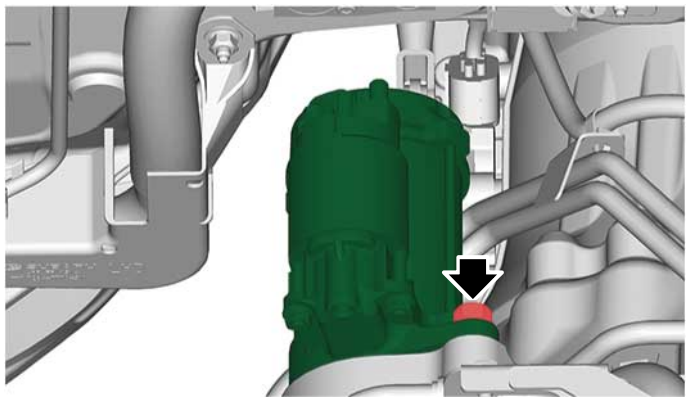

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STARTING/CHARGING SYSTEMS(H4DO) > Starter

INSTALLATION

1. Set the starter to the transmission, and temporarily install the bolt which secures the upper side of the starter.

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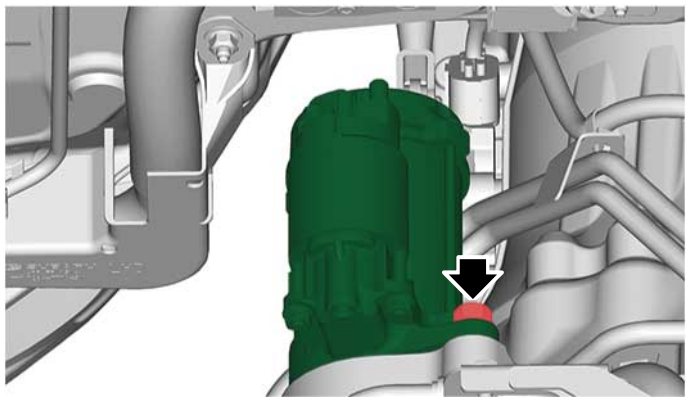

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2. Lift up the vehicle.
3. Install the bolt which secures the lower side of the starter together with the cable stay.
   Tightening torque:
   50 N·m (5.1 kgf-m, 36.9 ft-lb)

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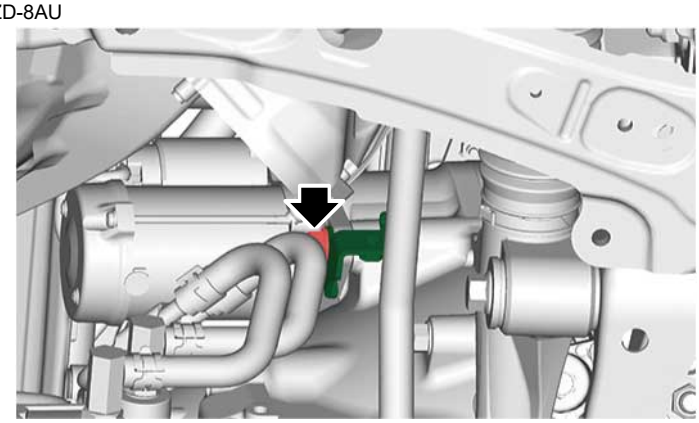

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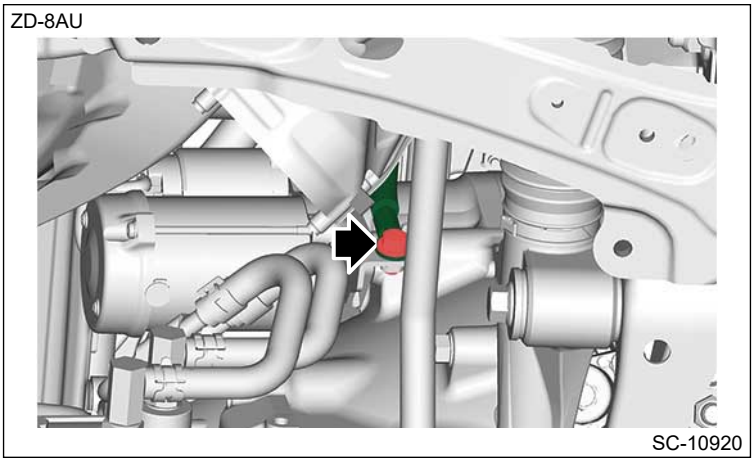
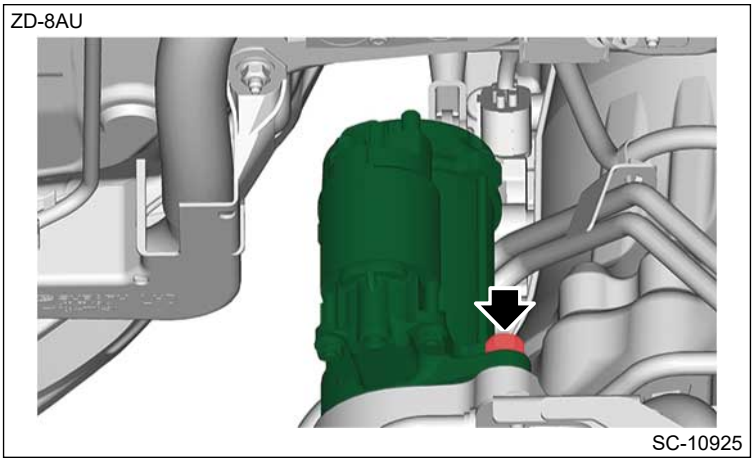
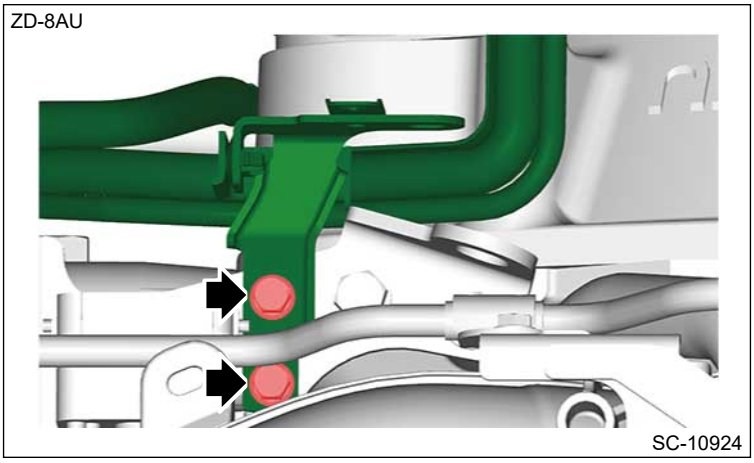
4. Connect the ground terminal.
   Tightening torque:
   14 N·m (1.4 kgf-m, 10.3 ft-lb)



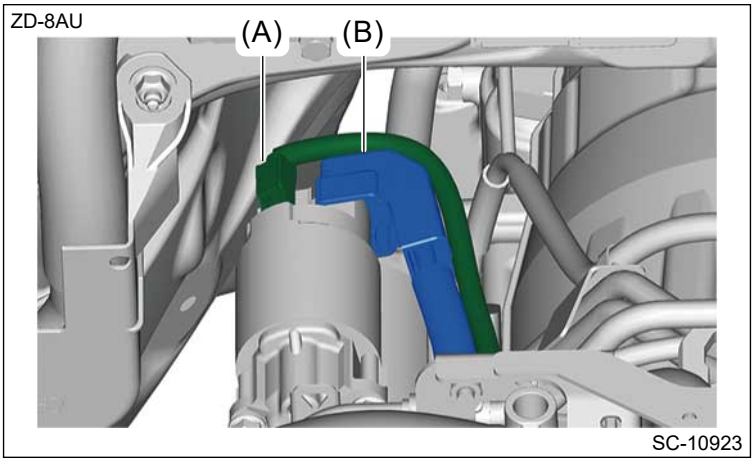
5. Install the center exhaust pipe. Ref. to EXHAUST(H4DO)>Center Exhaust Pipe>INSTALLATION.
6. Lower the vehicle.
7. Tighten the bolt which secures the upper side of the starter.
   Tightening torque:
   50 N·m (5.1 kgf-m, 36.9 ft-lb)



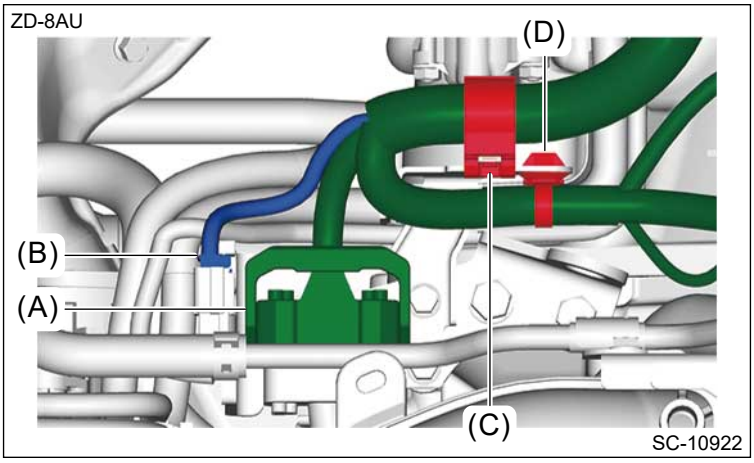
8. Install the bracket to the engine rear hanger.
   Tightening torque:
   10 N·m (1.0 kgf-m, 7.4 ft-lb)



9. Connect the terminal B (B) and connector (A).
Tightening torque:
11 N·m (1.1 kgf-m, 8.1 ft-lb)



10. Secure the bulkhead wiring harness with clip (D) and clip (C), and connect connector (B) and connector (A).



11. Install the collector cover. Ref. to FUEL INJECTION (FUEL SYSTEMS)(H4DO)>Collector Cover>INSTALLATION.

12. Connect the ground terminal to battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.

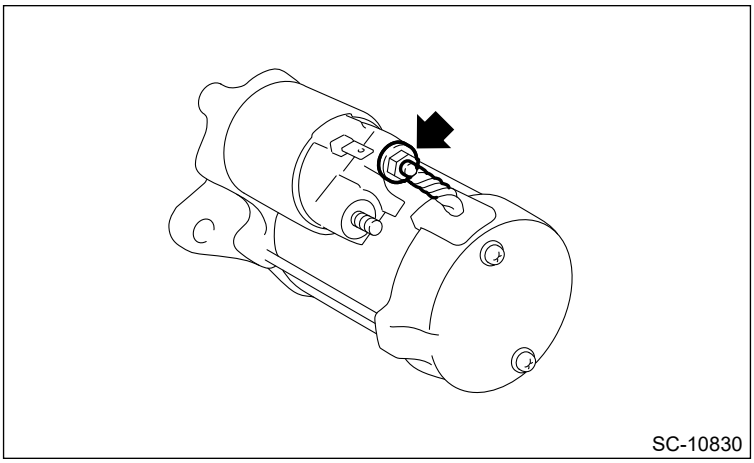
STARTING/CHARGING SYSTEMS(H4DO) > Starter

DISASSEMBLY

Caution:
The starter should be placed through a no-load test whenever it has been overhauled.

1. AT model

1. Disconnect the cable from the M terminal.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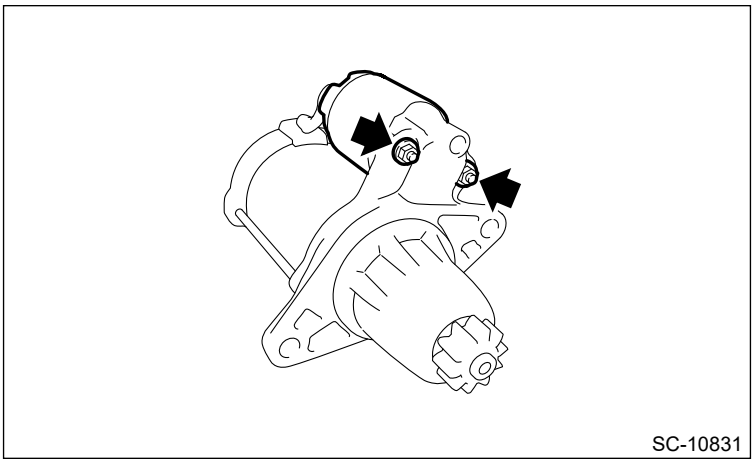
2. Remove the magnet switch assembly.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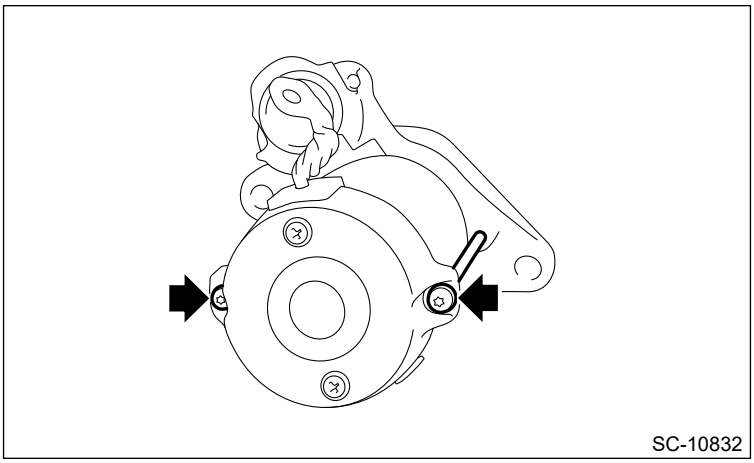
3. Using TORX® T25, remove the through bolts.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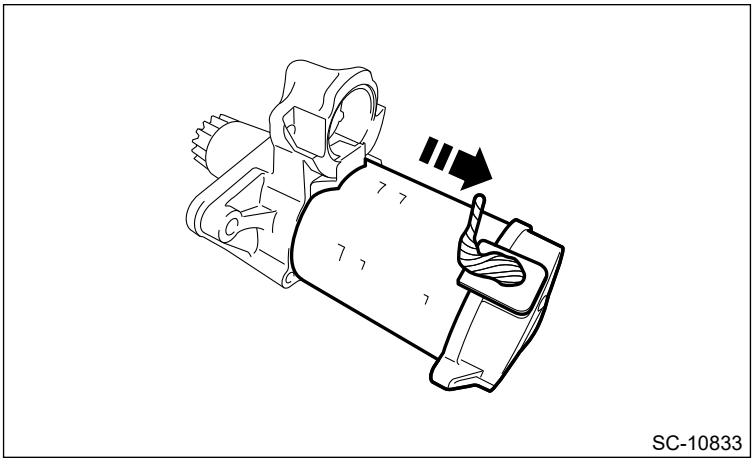
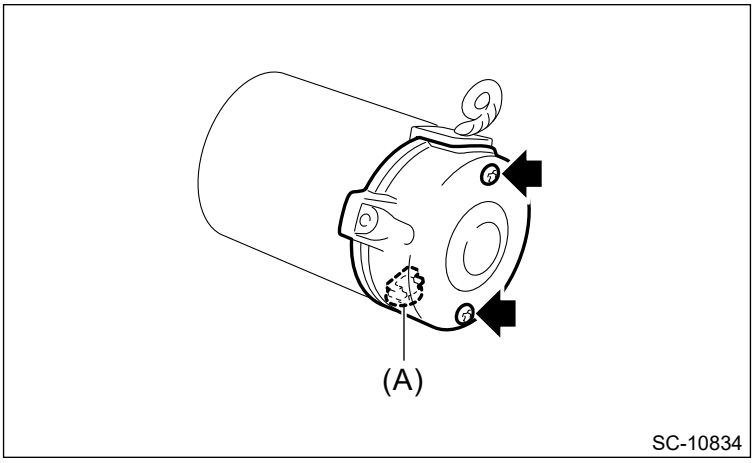
4. Remove the yoke assembly and starter cover as a unit.



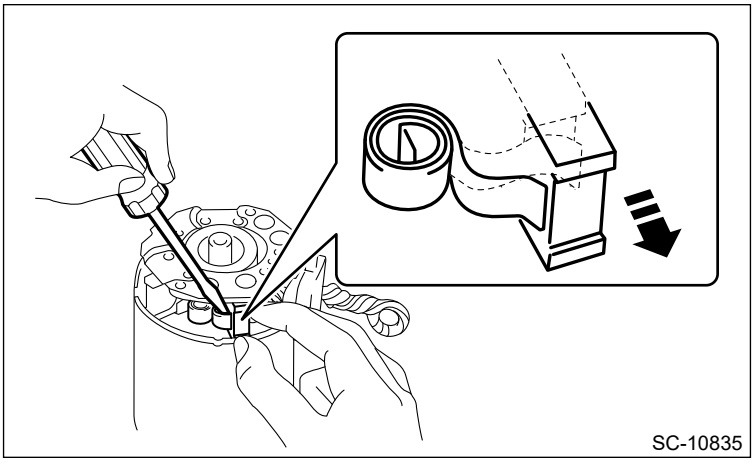
5. Remove the starter cover and remove the drain duct (A) from the yoke assembly.



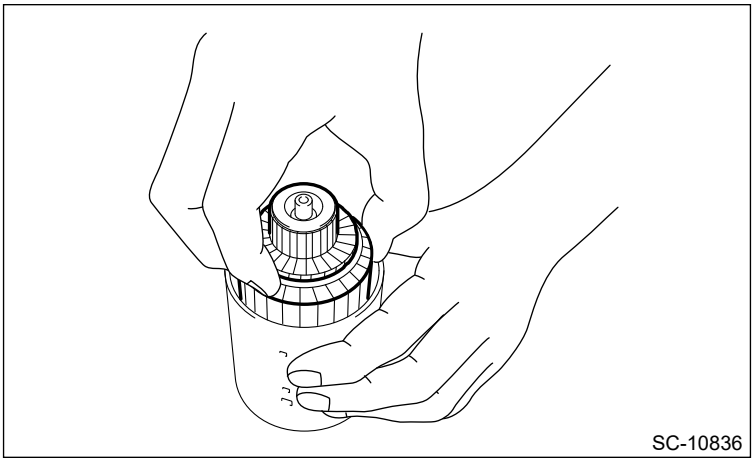
6. Remove the brush holder assembly.

(1) Using a screwdriver, remove the spring from the brush bushing.

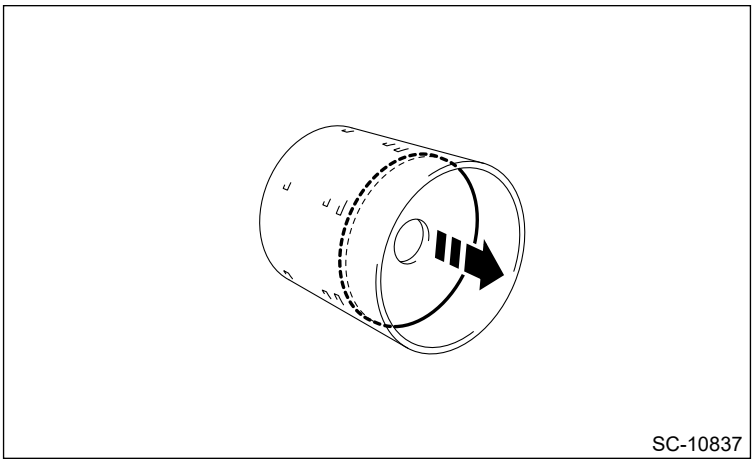
(2) Remove the 4 brushes from the brush holder assembly and remove the brush holder assembly from the yoke assembly.



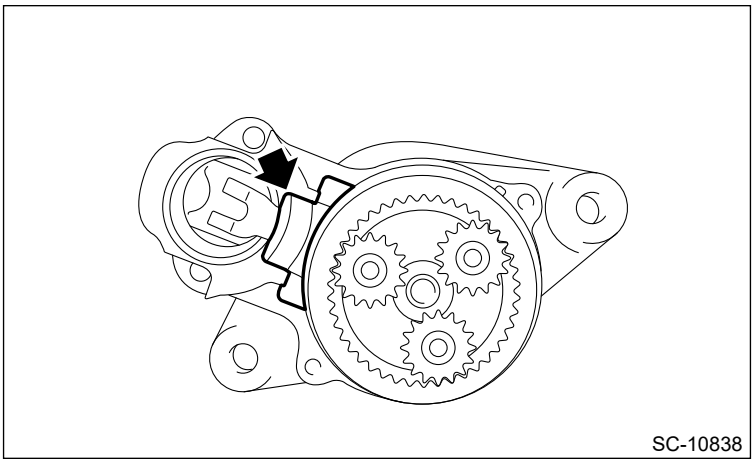
7. Separate the armature assembly and yoke assembly.



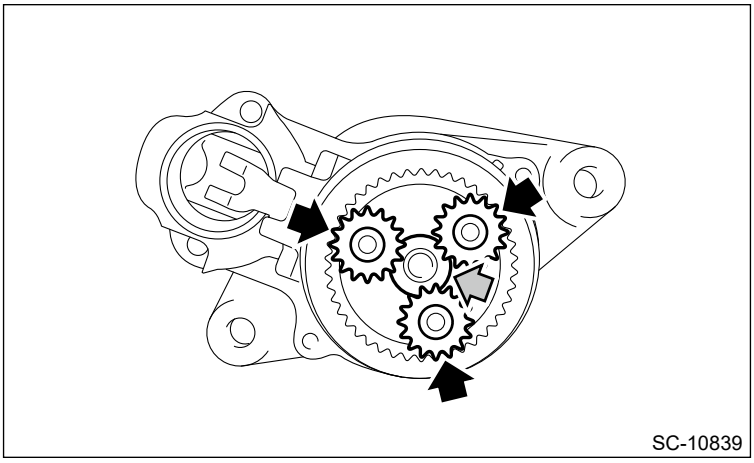
8. Remove the plate from the yoke assembly.



9. Remove the seal rubber from the starter drive housing assembly.

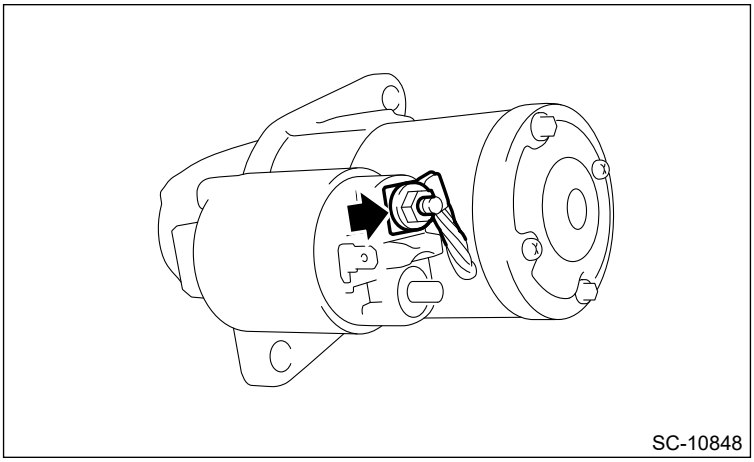


10. Remove the pinion gear, and remove the pinion stopper washer.

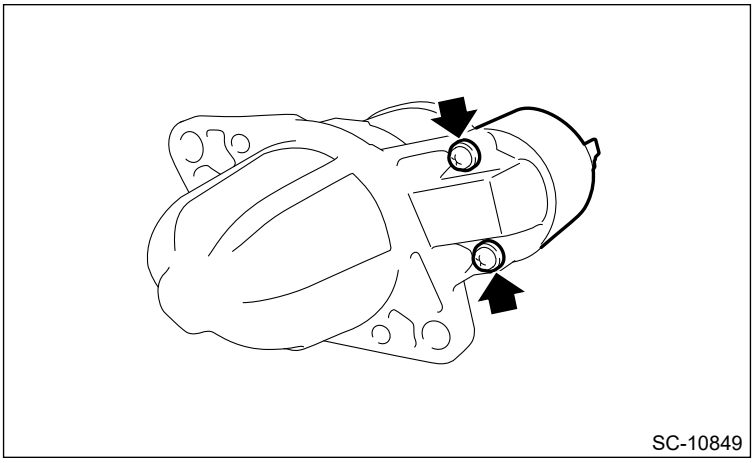


2. MT model

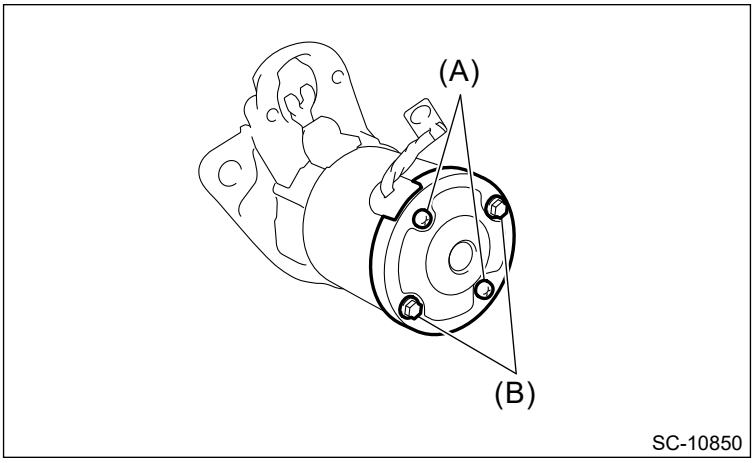
1. Disconnect the cable from the M terminal.



2. Remove the magnet switch assembly.

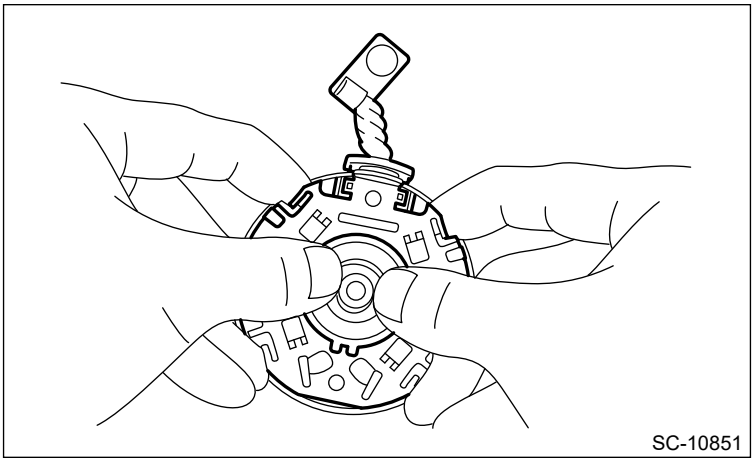


3. Remove the bolt (A) and through bolts (B), and remove the starter cover.

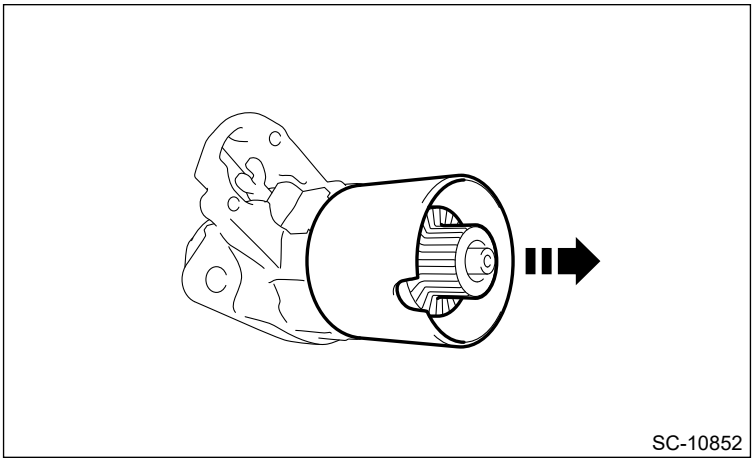


4. Remove the brush holder assembly.

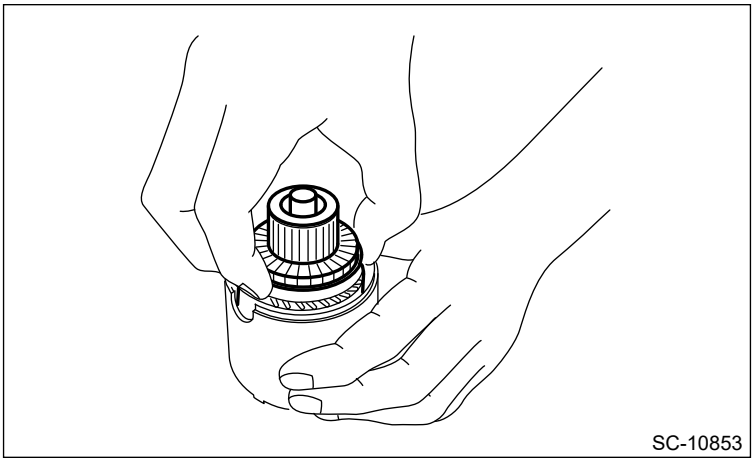
Note:
Hold the brush with your fingers so that the brush spring does not come flying out.



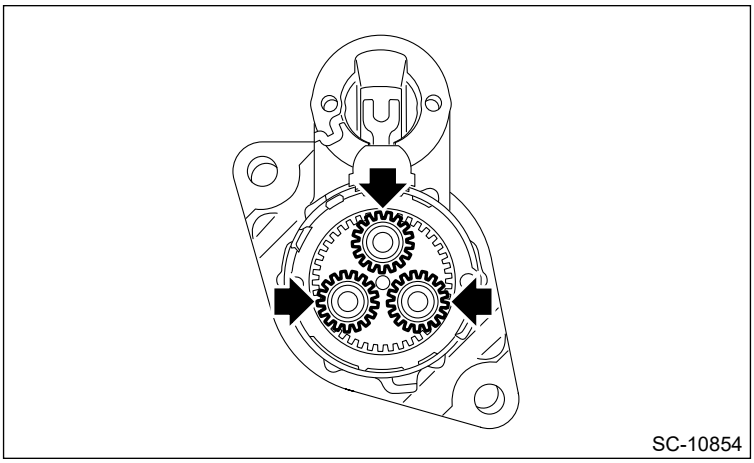
5. Remove the armature assembly and yoke assembly together as a single unit.



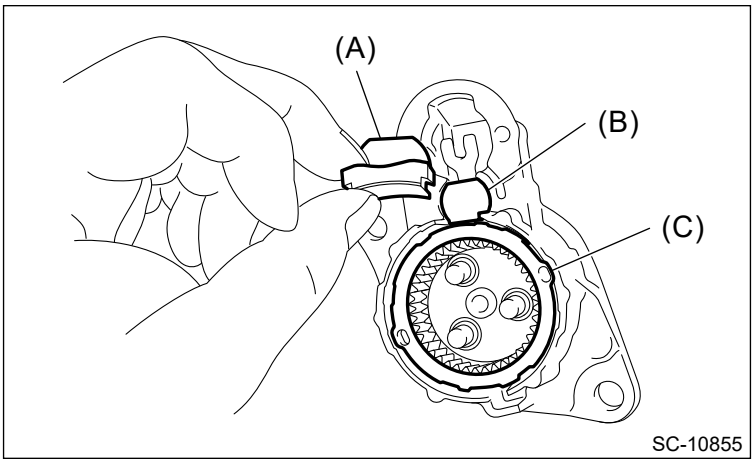
6. Separate the armature assembly and yoke assembly.



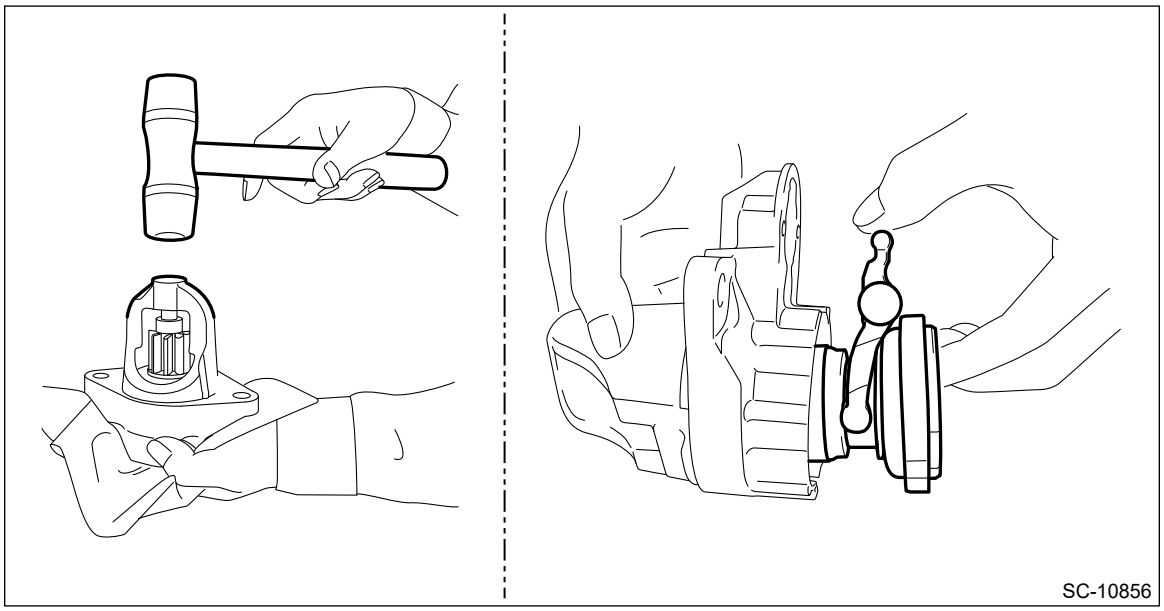
7. Remove the pinion gear from the internal gear.



8. Remove seal rubber (A), plate (B), and seal rubber (C).

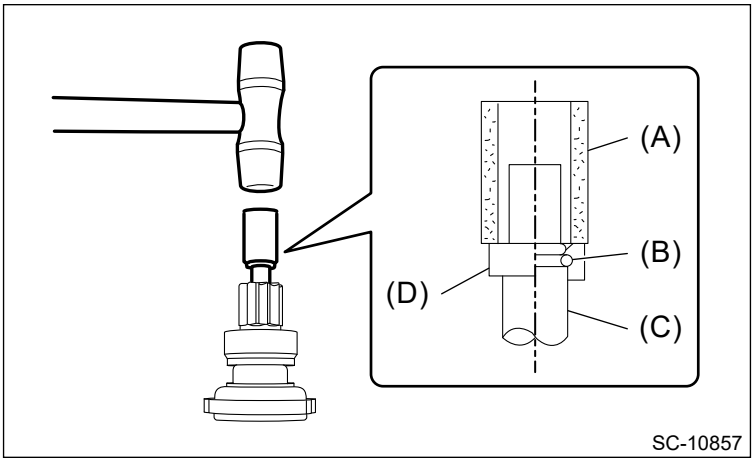


9. Lightly tap the starter housing with a plastic hammer as shown in the figure, and remove the overrunning clutch, internal gear, shaft and shift lever together as one unit.



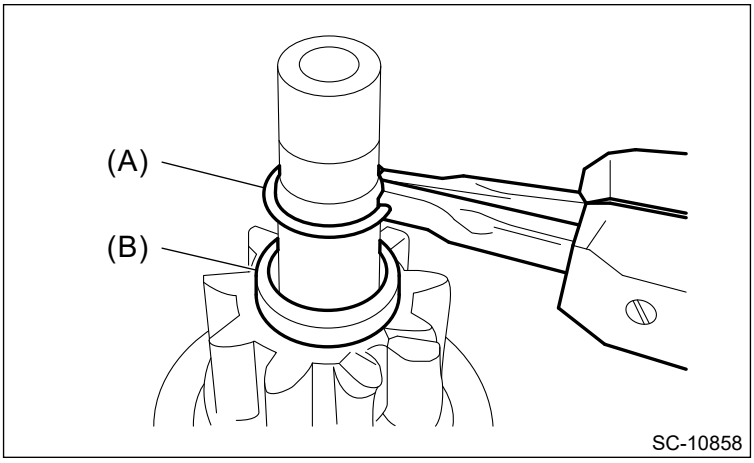
10. Use the following procedures to remove the overrunning clutch.

(1) Set an appropriate tool (suitable attachment, etc.), and remove the stopper from snap ring by lightly tapping the stopper with a plastic hammer.

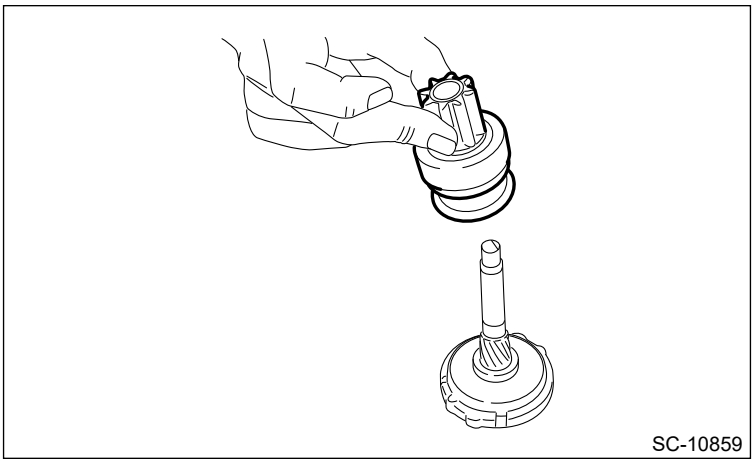


(A) Appropriate tool
(B) Snap ring
(C) Shaft
(D) STOPPER

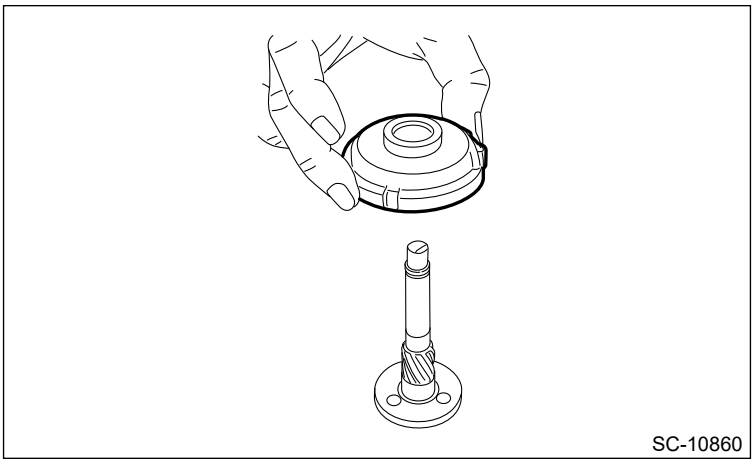
(2) Remove the snap ring (A), and remove the stopper (B).



(3) Remove the overrunning clutch.



11. Remove the internal gear.



STARTING/CHARGING SYSTEMS(H4DO) > Starter

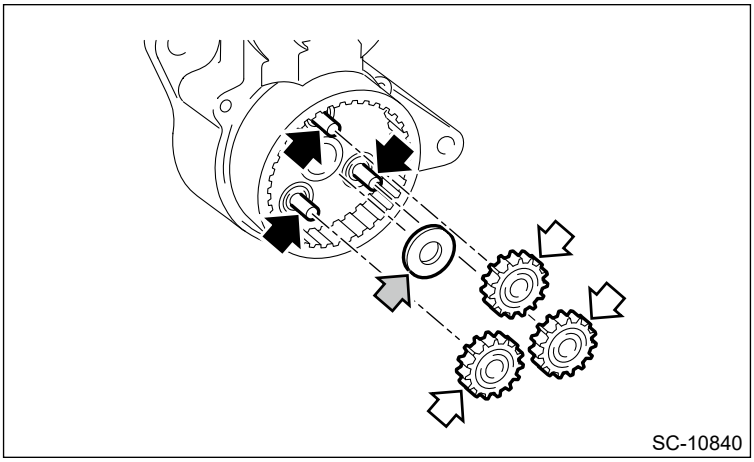
ASSEMBLY

1. AT model

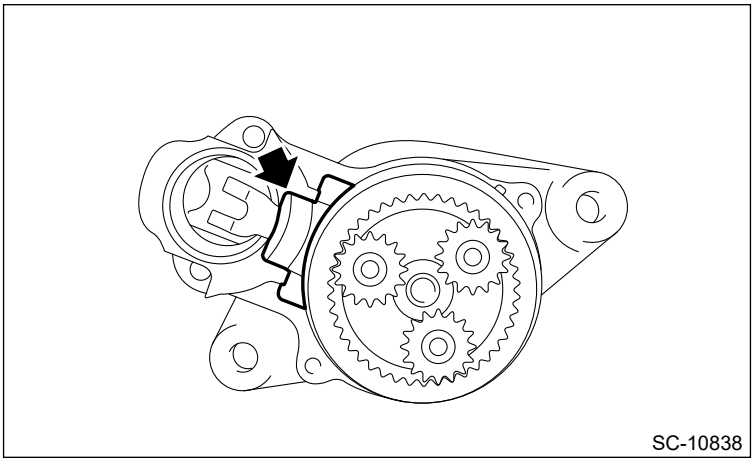
1. Apply grease to the inside of the internal gear, pinion stopper washer and pinion gear, and attach the pinion stopper washer and pinion gear to the internal gear.

Note:
Apply grease evenly to the contact surfaces of each gear.

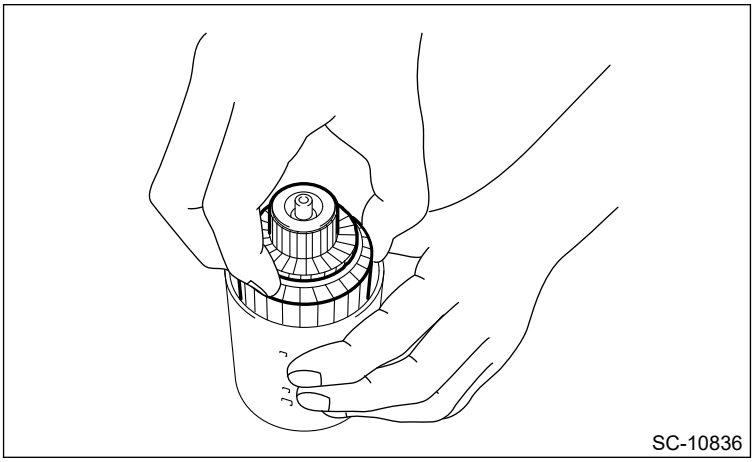
Preparation items:
Grease: Denso HL50 or equivalent


SC-10840

2. Install the seal rubber to the starter drive housing assembly.

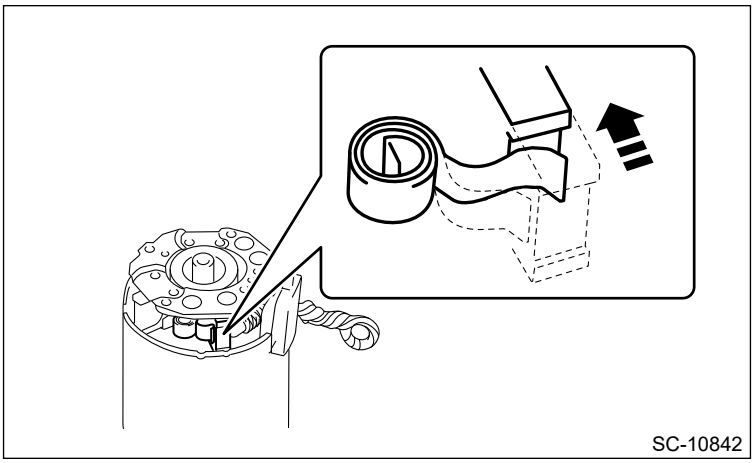

SC-10838

3. Set the armature assembly to the yoke assembly.

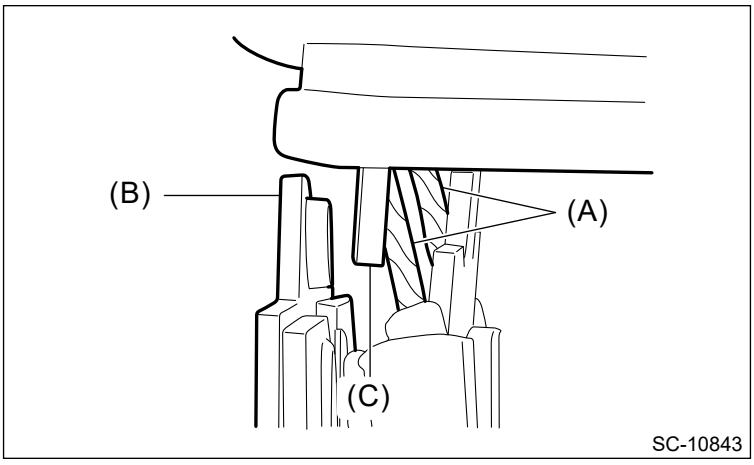

SC-10836

4. Install the brush holder assembly.
(1) Set 4 brushes in the brush holder.

(2) Install the brush holder to the yoke assembly and install the spring to the bushing on each brush.



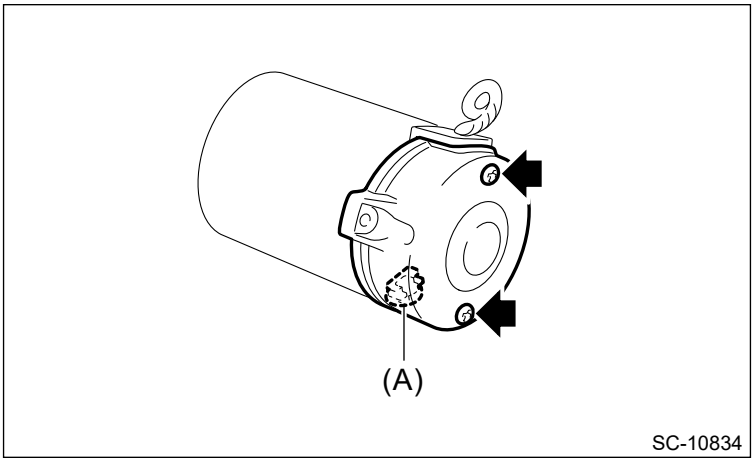
(3) Insert the grommet (C) between the lead wire (A) of the brush and the brush holder (B).



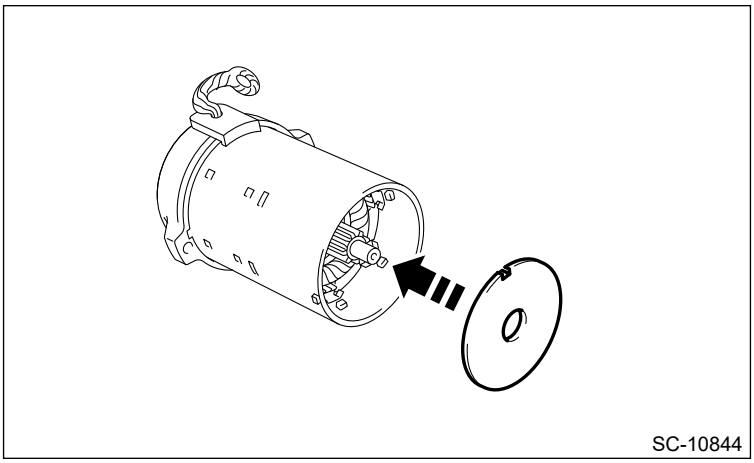
5. Set the drain duct (A) to the yoke assembly and install the starter cover.

Tightening torque:

1.5 N·m (0.2 kgf-m, 1.1 ft-lb)

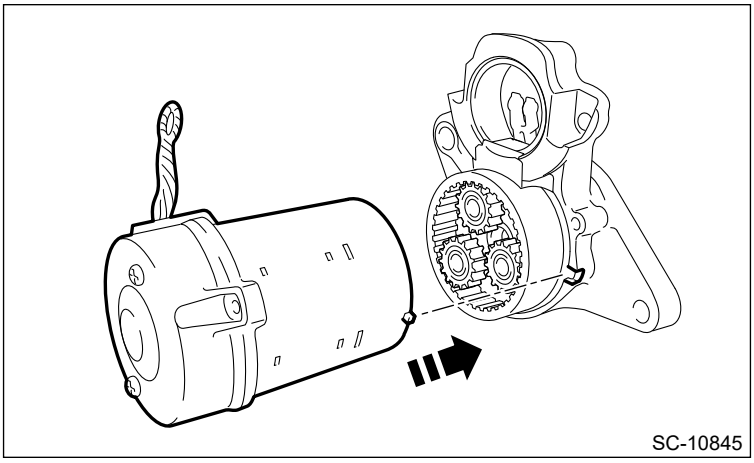


6. Install the plate to the yoke assembly.



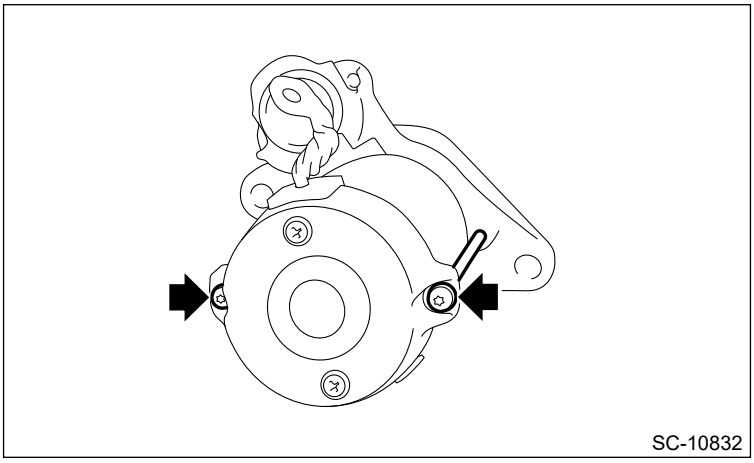
7. Install the yoke assembly and starter cover to the starter drive housing assembly as a single unit.

Note:
Match the protrusion of the yoke assembly to the cutout of the starter drive housing assembly.



8. Using TORX® T25, install the through bolts.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

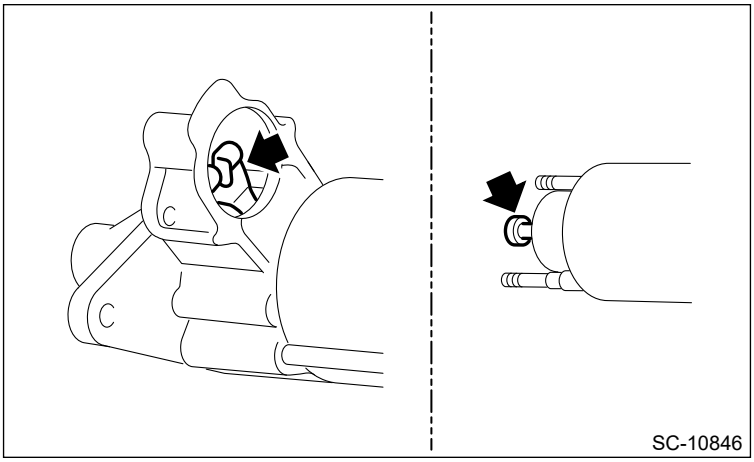


9. Install the magnet switch assembly.

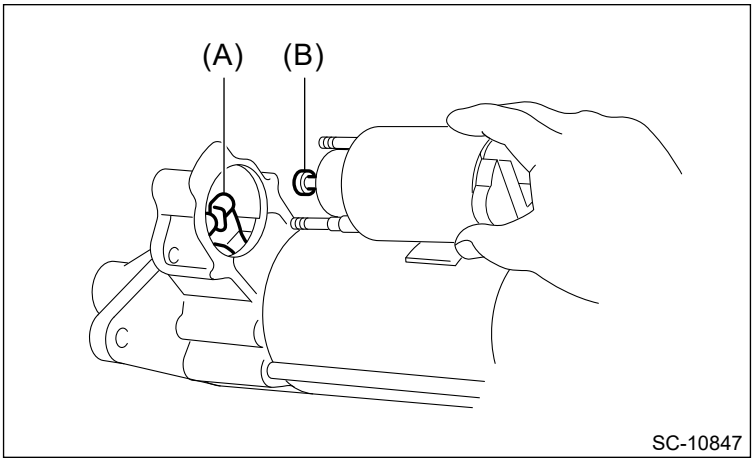
(1) Apply grease to the shift lever hook and the magnet switch plunger.

Preparation items:

Grease: Denso HL50 or equivalent



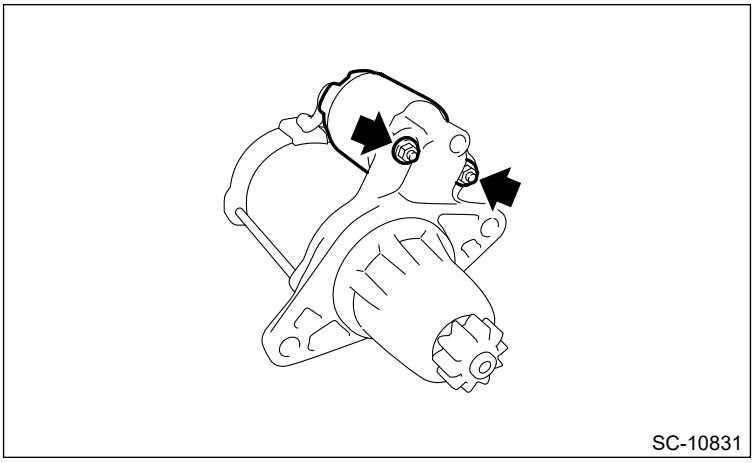
(2) Set the magnet switch plunger (B) to the shift lever hook (A).



(3) Tighten the nuts securing the magnet switch assembly.

Tightening torque:

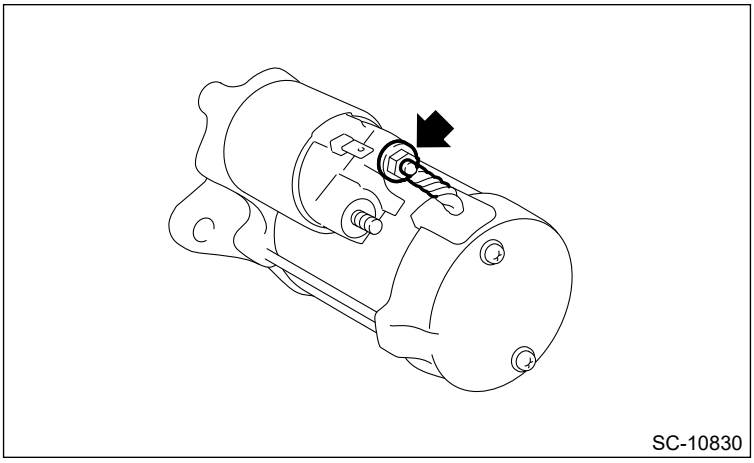
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)


SC-10831

10. Connect the cable to the terminal M.

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)

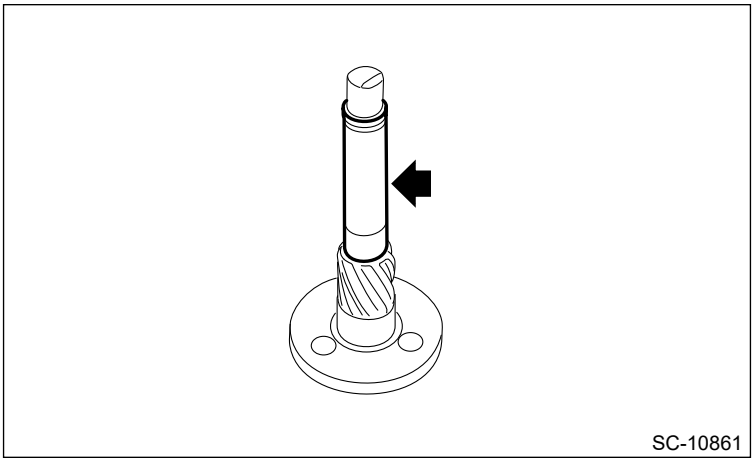

SC-10830

2. MT model

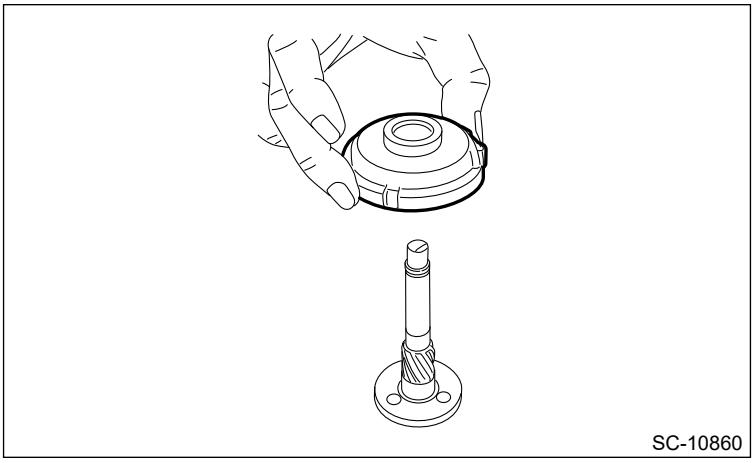
1. Apply grease to the shaft sliding surfaces of the internal gear.

Preparation items:

Grease: Multemp #6129 or equivalent


SC-10861

2. Install the internal gear to the shaft.

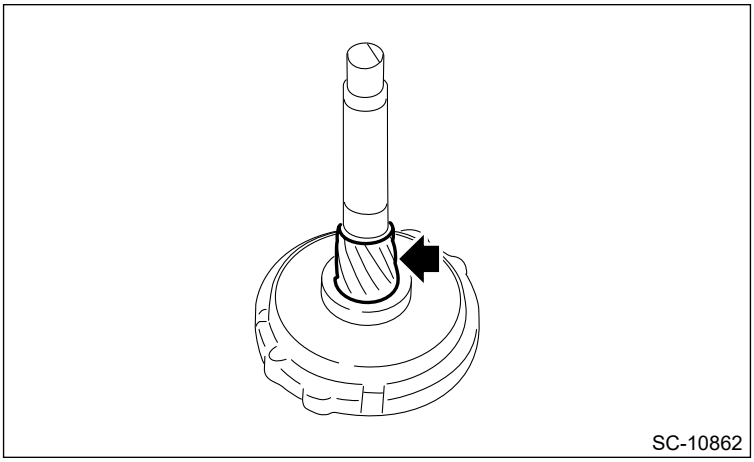


3. Install the overrunning clutch as follows:

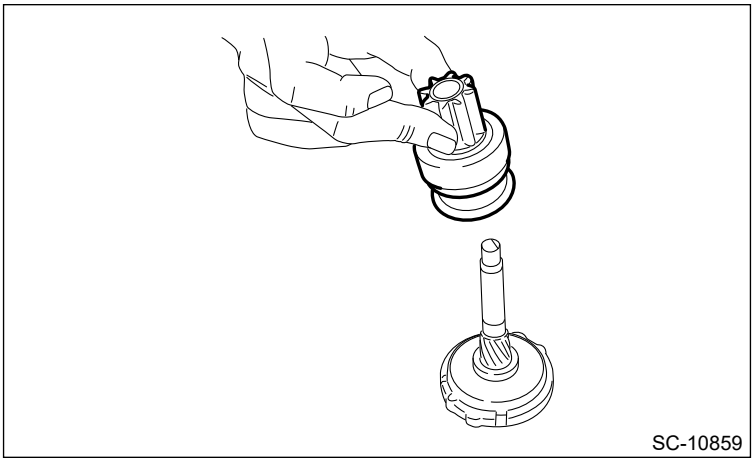
(1) Apply grease to the spline portion of the shaft.

Preparation items:

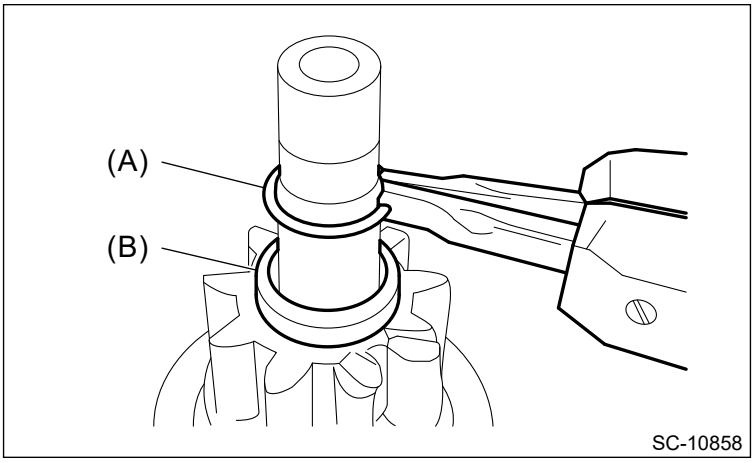
Grease: Multemp #6129 or equivalent



(2) Set the overrunning clutch.

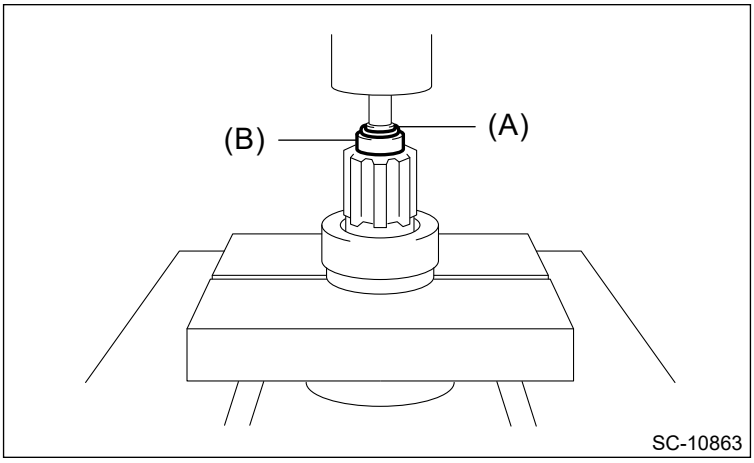


(3) Pass a new stopper (B) through, and attach a new snap ring (A).



(4) Using a press, pressure fit stopper (B) into snap ring (A).

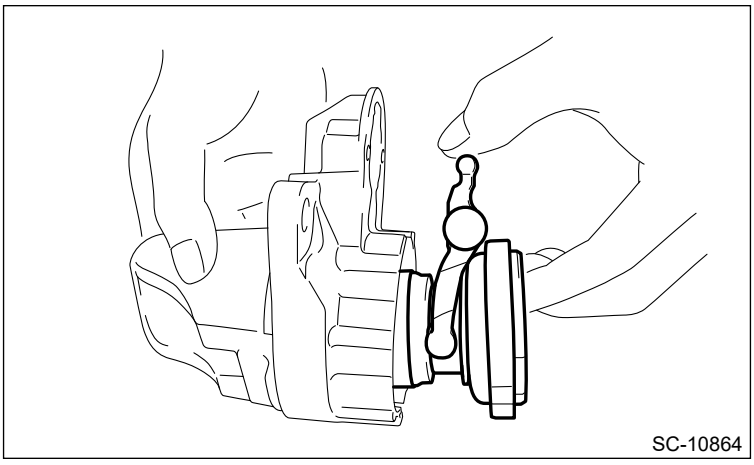
Caution:
Do not apply any load to the internal gear.



4. Install the overrunning clutch, internal gear, shaft and shift lever as a single unit to the starter housing.

Note:
Apply grease to the moving parts of the shift lever.

Preparation items:
Grease: Multemp #6129 or equivalent

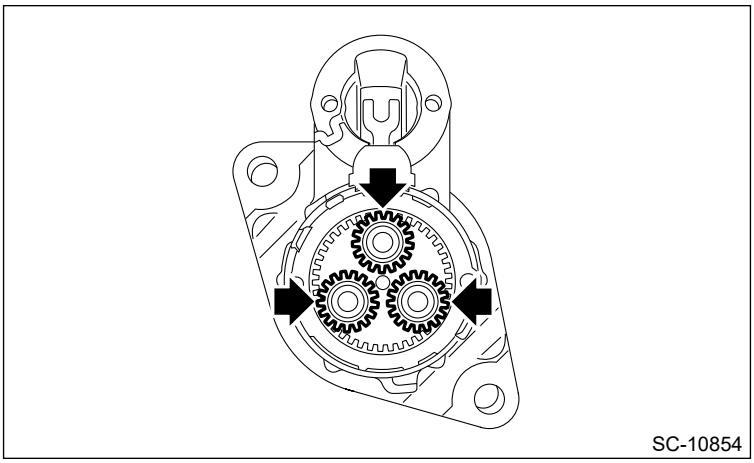


5. Apply grease to the inside of the internal gear and pinion gear, and attach the pinion gear to the internal gear.

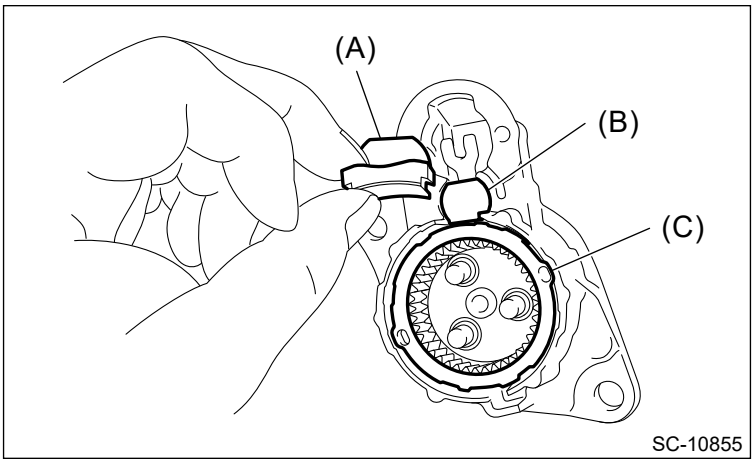
Note:
Apply grease evenly to the contact surfaces of each gear.

Preparation items:

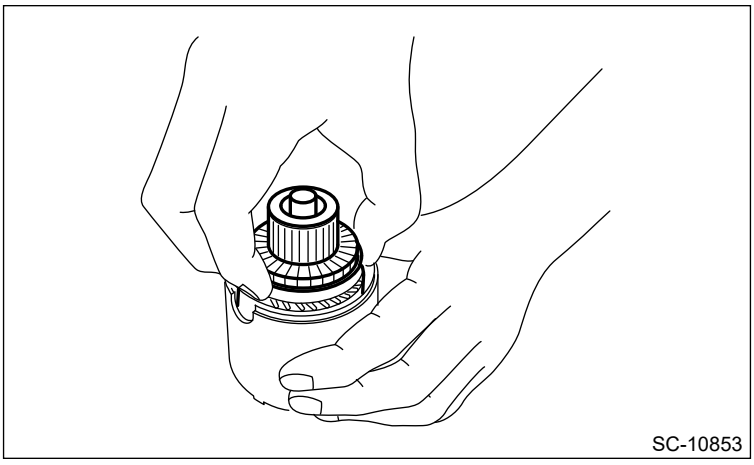
Grease: Molykote® AG650 or equivalent



6. Install the seal rubber (C), plate (B), and seal rubber (A).

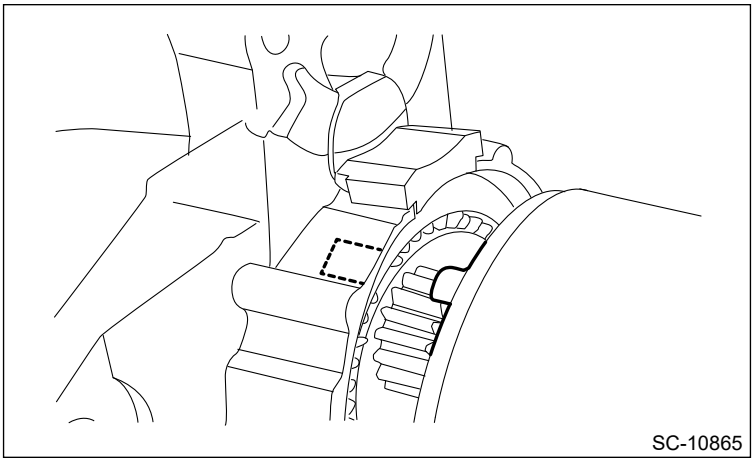


7. Set the armature assembly to the yoke assembly.



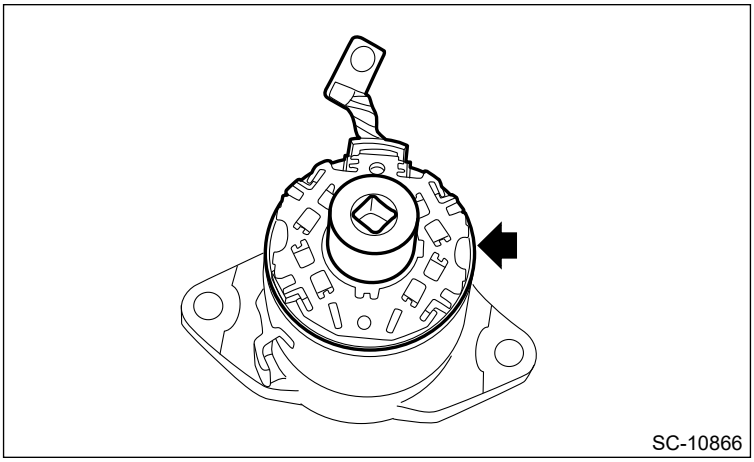
8. Attach the armature assembly and yoke assembly to the starter housing together as a single unit.

Note:
Match the protrusion of the yoke assembly to the cutout of the starter housing.


SC-10865

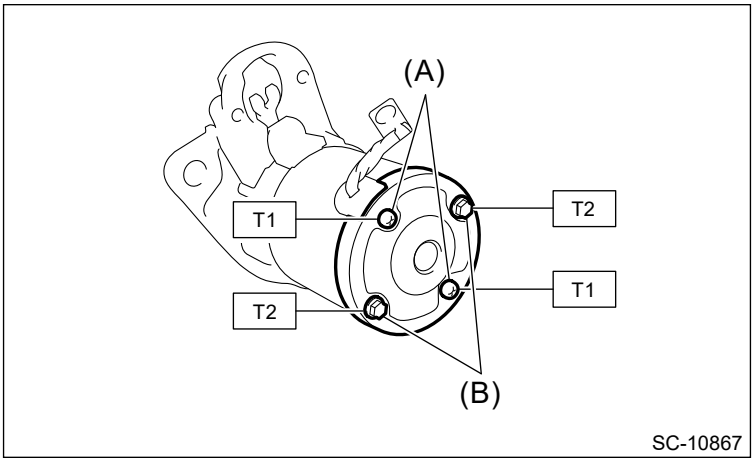
9. Use an appropriate tool (suitable attachment, etc.) to attach the brush holder assembly.

Note:
Be careful not to damage the brushes.


SC-10866

10. Set the starter cover and install the bolts (A) and through bolts (B).

Tightening torque:
T1: 1.4 N·m (0.1 kgf-m, 1.0 ft-lb)
T2: 6 N·m (0.6 kgf-m, 4.4 ft-lb)

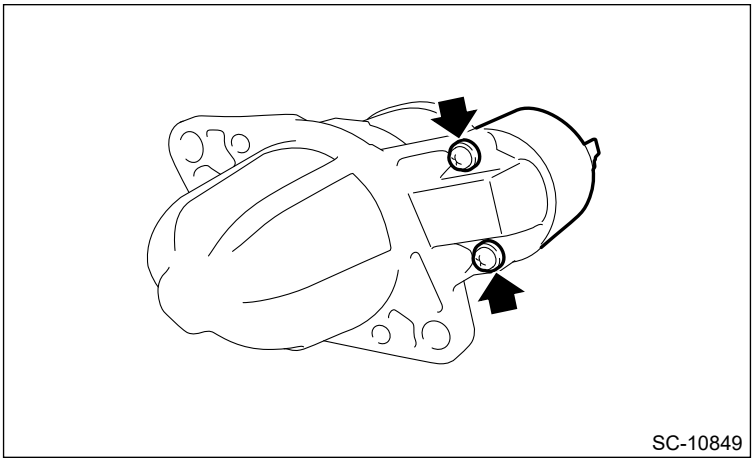


SC-10867

11. Install the magnet switch assembly.

Tightening torque:

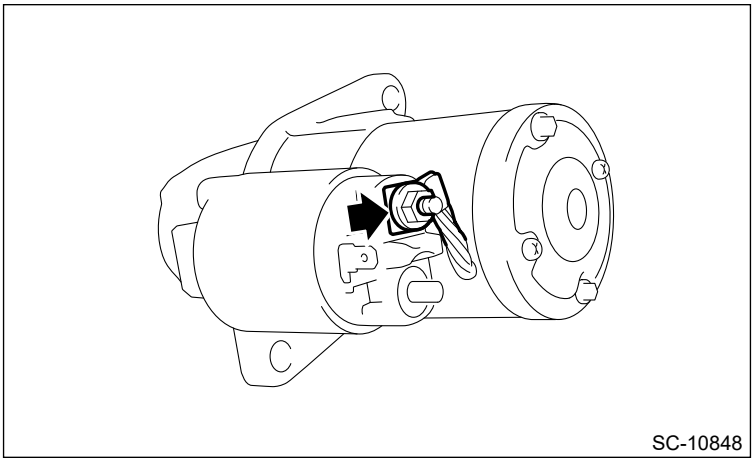
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



12. Connect the cable to the terminal M.

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)



STARTING/CHARGING SYSTEMS(H4DO) > Starter

INSPECTION

Note:
For the disassembly or assembly procedures required for inspection, refer to DISASSEMBLY or ASSEMBLY of Starter.

- Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Starter>DISASSEMBLY.
- Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Starter>ASSEMBLY.

1. ARMATURE ASSEMBLY

- **AT model**

1. Check the commutator for signs of seizure or stepped wear. If the symptom is minor, use sandpaper to repair. If it cannot be repaired, replace the armature assembly.

2. Measure runout on the commutator.

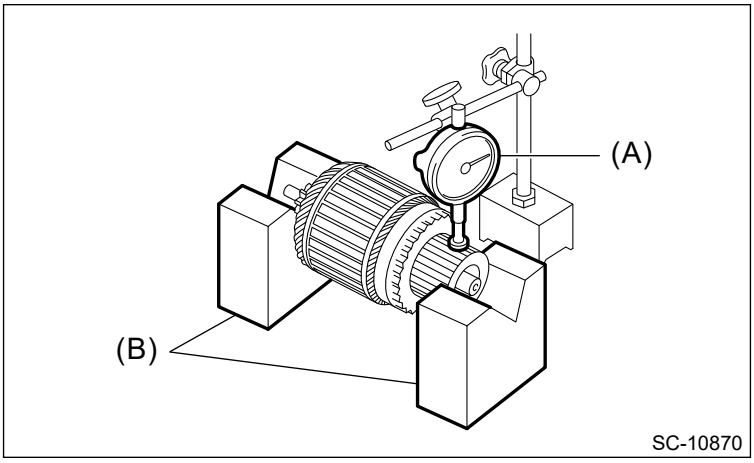
Commutator runout:

Standard

0.02 mm (0.0008 in)

Limit

0.05 mm (0.0020 in)



(A) Dial gauge (B) V-block

3. Measure diameter of the commutator.

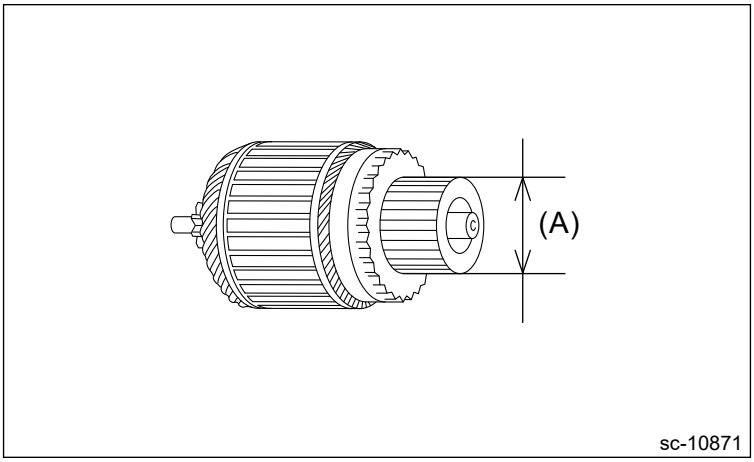
Commutator diameter:

Standard

29 mm (1.1417 in)

Limit

28 mm (1.1024 in)



(A) Diameter

4. Measure the depth of the segment mold.

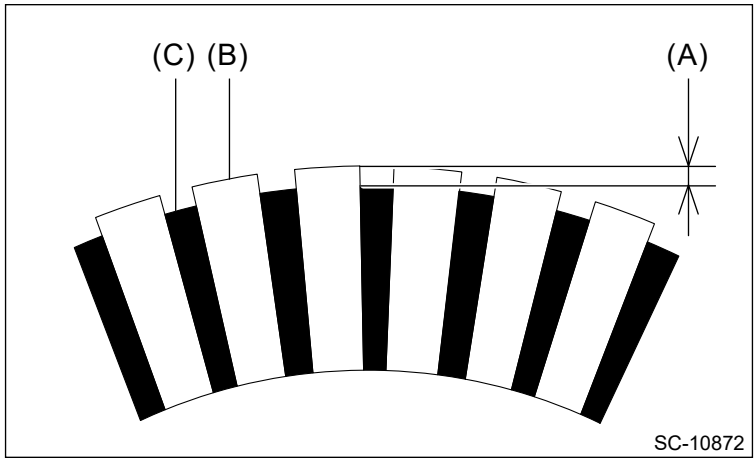
Depth of segment mold:

Standard

0.70 mm (0.0276 in)

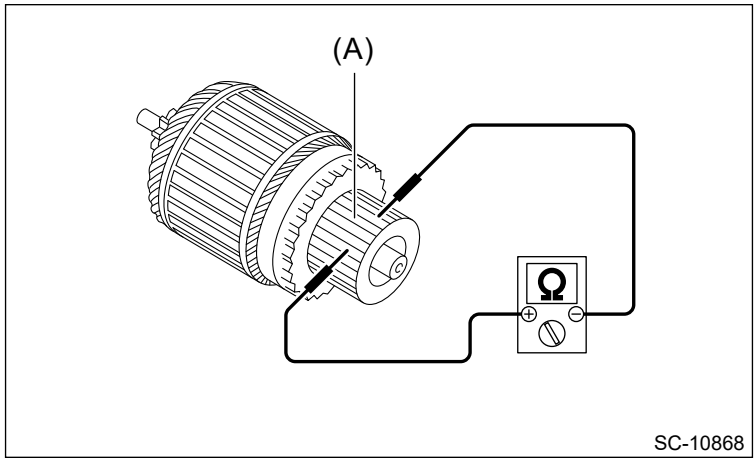
Limit

0.20 mm (0.0079 in)



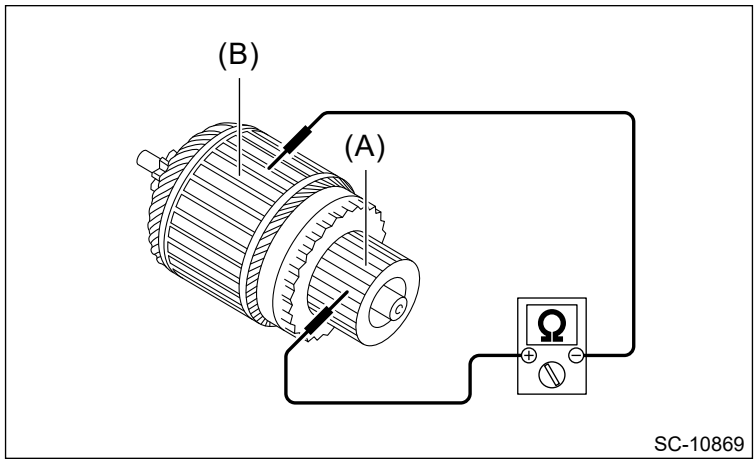
(A) Depth of mold (B) Segment (C) Mold

5. Check the continuity in the commutator segment. If there is no continuity, replace the armature assembly.



(A) Commutator segment

6. Check insulation between the commutator segment and armature core. If there is continuity, replace the armature assembly.



(A) Commutator segment (B) Armature core

- **MT model**

1. Check the commutator for signs of seizure or stepped wear. If the symptom is minor, use sandpaper to repair. If it cannot be repaired, replace the armature assembly.
2. Measure runout on the commutator.

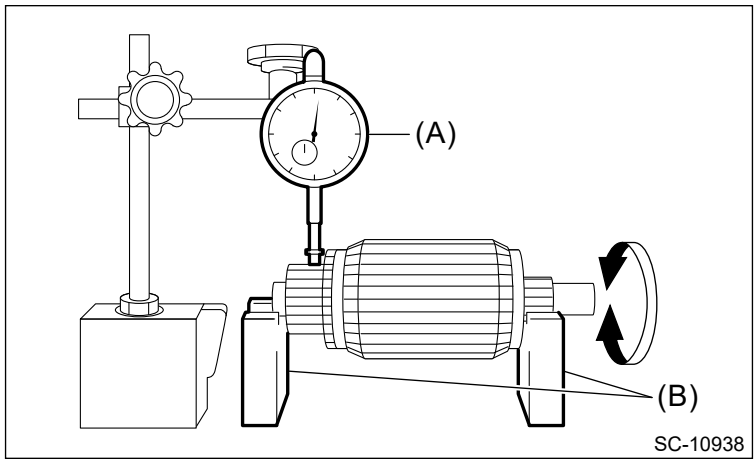
Commutator runout:

Standard

0.05 mm (0.0020 in)

Limit

0.10 mm (0.0039 in)



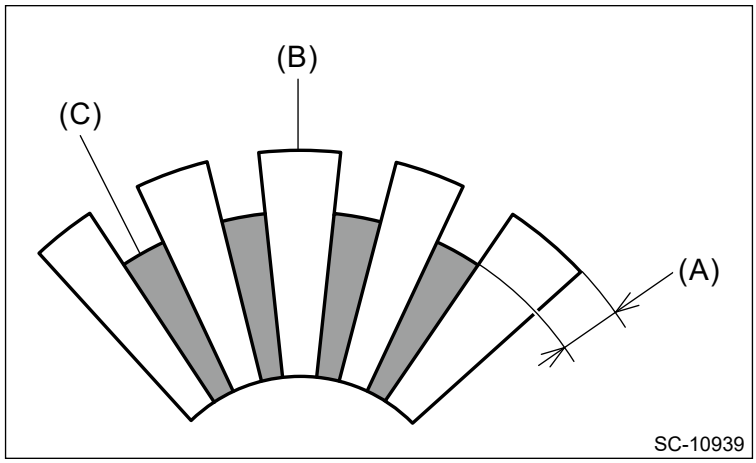
(A) Dial gauge (B) V-block

3. Measure the depth of the segment mold. If it is not within the specification, replace the armature assembly.

Depth of segment mold:

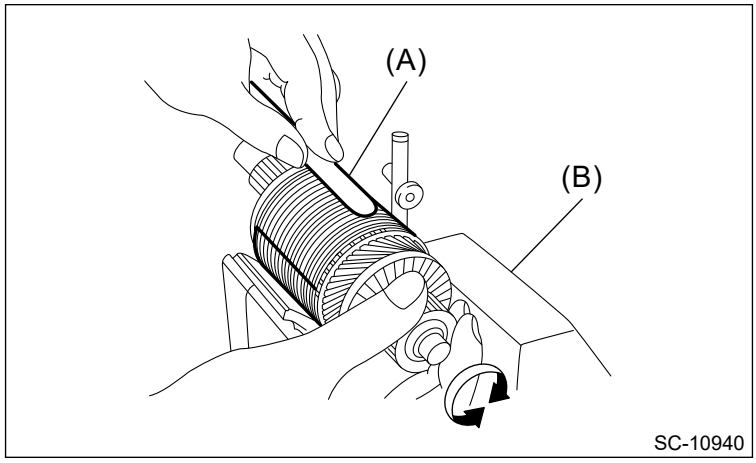
Standard

0.05 mm (0.0020 in)



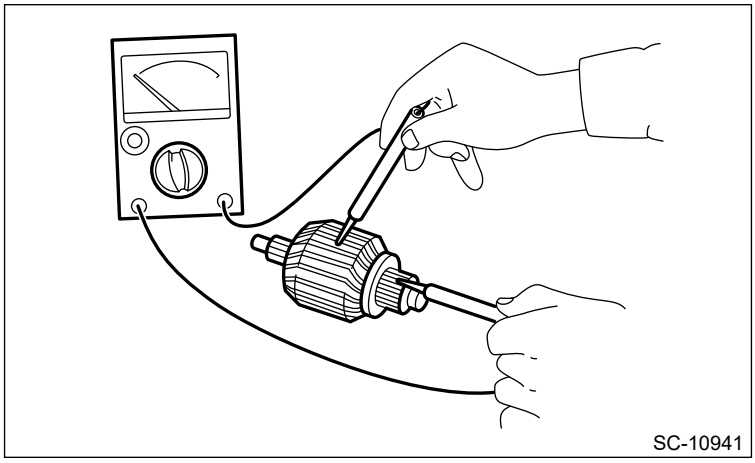
(A) Depth of mold (B) Segment (C) Mold

4. Place the armature assembly on the growler tester to check for short circuits. While slowly turning the armature assembly, support the steel sheet for the armature core. If the circuit of the armature is shorted, the steel sheet will vibrate, causing it to move towards the core. When the steel sheet has moved or vibrated, replace the armature.



(A) Steel sheet (B) Growler tester

5. Check insulation between commutator segment and shaft. If there is continuity, replace the armature assembly.



2. YOKE ASSEMBLY

- **AT model**
  Inspect the yoke assembly, and if there is any deformation or damage, replace the yoke assembly.
- **MT model**
  Make sure that the pole is set at the predetermined position.

3. OVERRUNNING CLUTCH

- **AT model**
  Inspect the pinion, and if there is any wear or damage, replace the starter drive housing assembly. Also, check that the pinion rotates counterclockwise smoothly and does not rotate clockwise. If there is any fault, replace the starter drive housing assembly.

Note:
The starter drive housing assembly cannot be disassembled.

- **MT model**
  Inspect the pinion, and if there is any wear or damage, replace the overrunning clutch. Also, check that the pinion rotates counterclockwise smoothly and does not rotate clockwise. If there is any fault,

replace the overrunning clutch.

Caution:
To prevent spilling of grease, do not clean the overrunning clutch with oil.

4. BRUSH AND BRUSH HOLDER

- **AT model**

1. Visually check the brush. If there is any abnormal wear or cracks, replace the brush.
2. Measure the length of the brush.

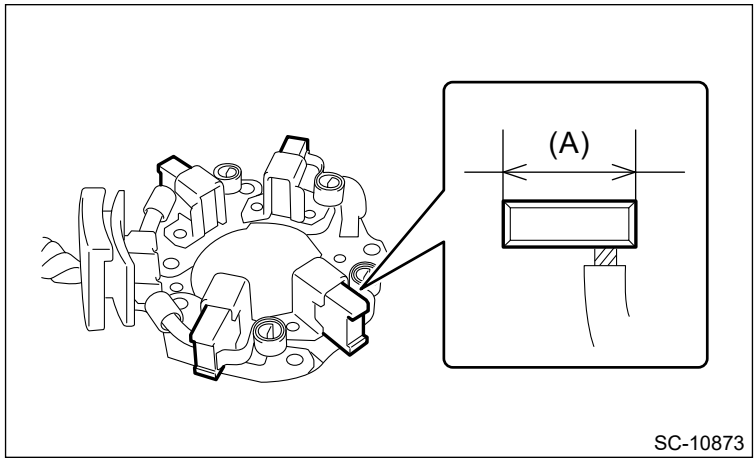
Brush length:

Standard

14.4 mm (0.5669 in)

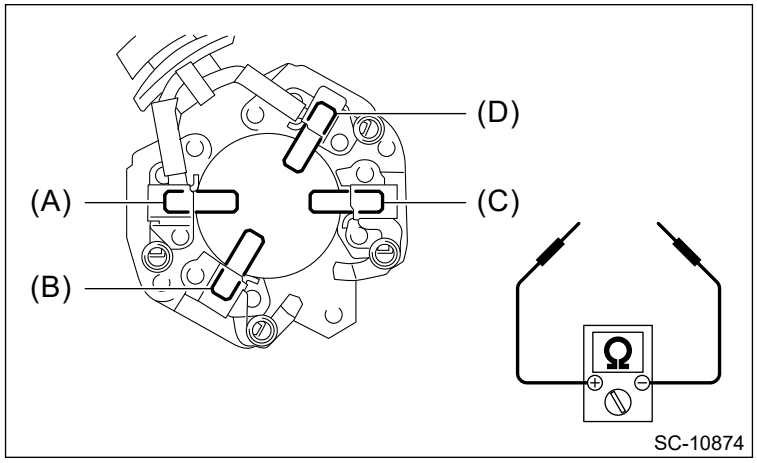
Limit

9.0 mm (0.3543 in)



(A) Brush length

3. Check the resistance between brushes shown in the following table.



Terminals	Standard
A — B	1 MΩ or more
A — C	
B — D	
C — D	

Terminals	Standard
A — D	1 Ω or less
B — C	

4. Check that the brush moves smoothly in the brush holder.

- **MT model**

1. Visually check the brush. If there is any abnormal wear or cracks, replace the brush.
2. Measure the length of the brush.

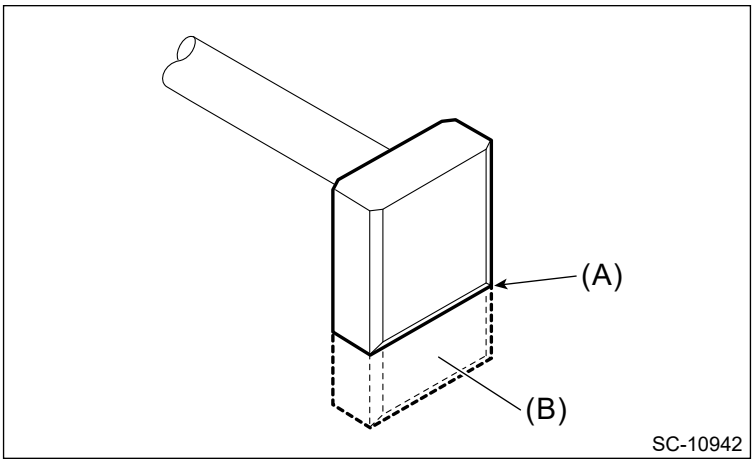
Brush length:

Standard

12.3 mm (0.4843 in)

Limit

7.0 mm (0.2756 in)



(A) Service limit line (B) Brush

3. Check that the brush moves smoothly in the brush holder.
4. Measure the brush spring force with a spring scale.

Brush spring force:

Standard

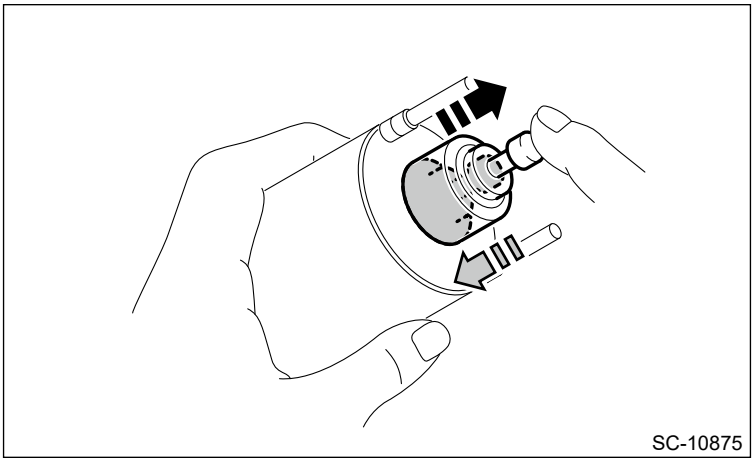
15.9 — 19.5 N (1.62 — 1.99 kgf, 3.54 — 4.38 lbf) (when new)

Limit

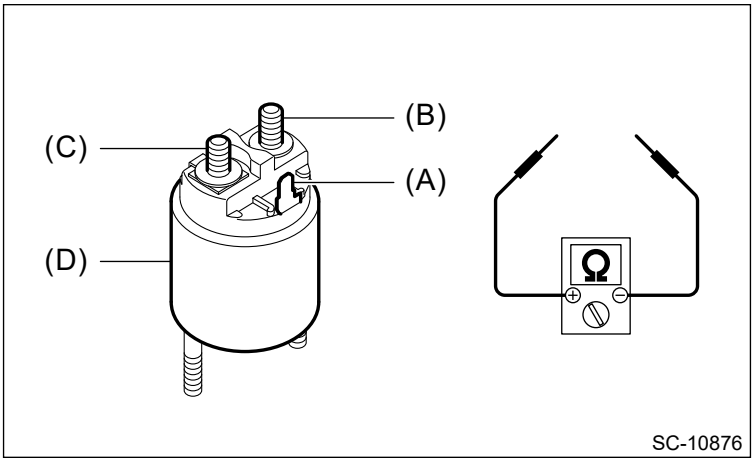
2.5 N (0.25 kgf, 0.56 lbf)

5. MAGNET SWITCH ASSEMBLY

1. Make sure the plunger returns to its original position immediately after pressed-in.



2. Using a circuit tester, check there is continuity between S terminal and M terminal, and between S terminal and ground. Also, check that there is no continuity between terminal M and terminal B.



(A) Terminal S
(B) Terminal B
(C) Terminal M
(D) Ground

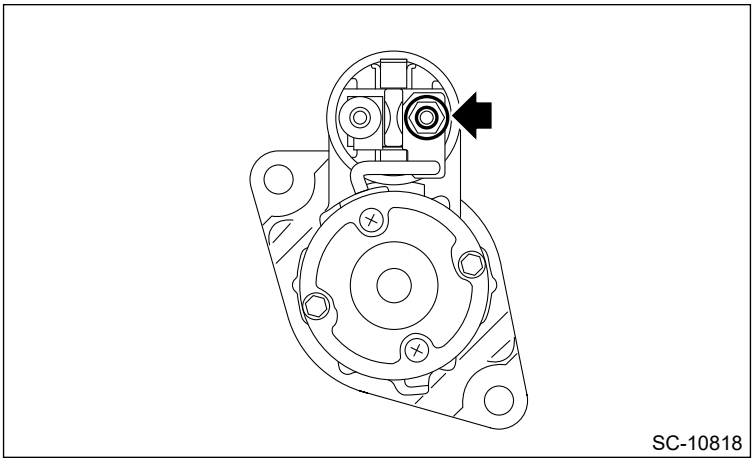
Terminals	Standard
Terminal S — terminal M	1 Ω or less
Terminal S — Ground	1 Ω or less
Terminal M — terminal B	1 MΩ or more

6. MAGNET SWITCH ASSEMBLY OPERATION

Caution:
Perform the inspection in a short period of time. (Within 3 to 5 seconds)

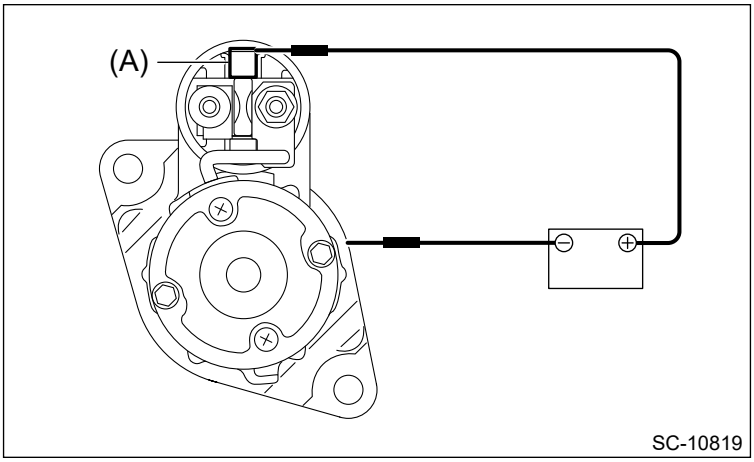
1. Loosen the nut which holds the cable to the M terminal.

Note:
This procedure is required to facilitate the cable removal from the M terminal.



2. Connect the battery positive terminal to the S terminal, and connect the battery negative terminal to the starter housing. Then, if the pinion protrudes, it is normal.

Note:
The motor may rotate while the pinion protrudes. This occurs due to current that flows to the motor via pull-in coil. This is not a problem.

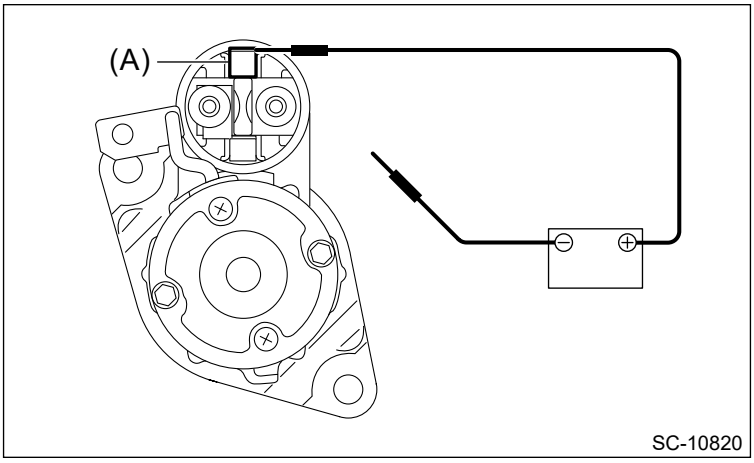


(A) Terminal S

3. Disconnect the cable from the M terminal. Check that the pinion is being protruded at this time.

Caution:
Hold the disconnected cable so that it does not contact the terminal or wiring.

4. Disconnect the battery negative terminal from the starter housing. Then, if the pinion returns to its original position, it is normal.

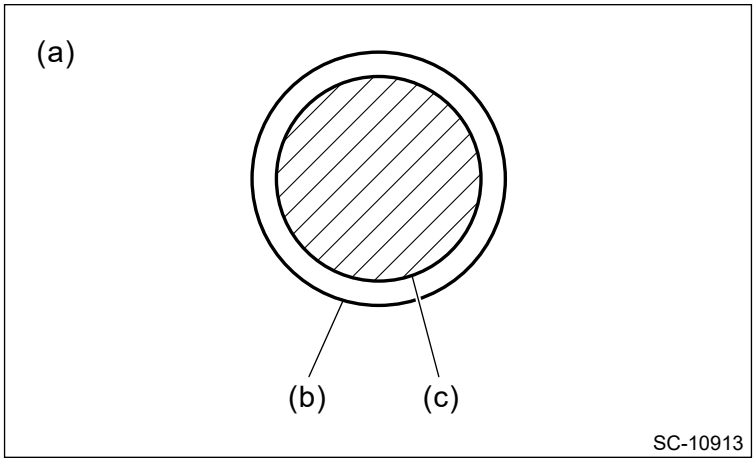


(A) Terminal S

7. NO-LOAD TEST

Caution:

- **Use a thick cable due to large current flowing through the cable.**
  1) For terminal B and ground, it is recommended that the cross-section area of continuity part (shaded part) should be 20 mm^2 (0.00310 sq in) or more. For S terminal, 1.25 mm^2 (0.00194 sq in) or more.



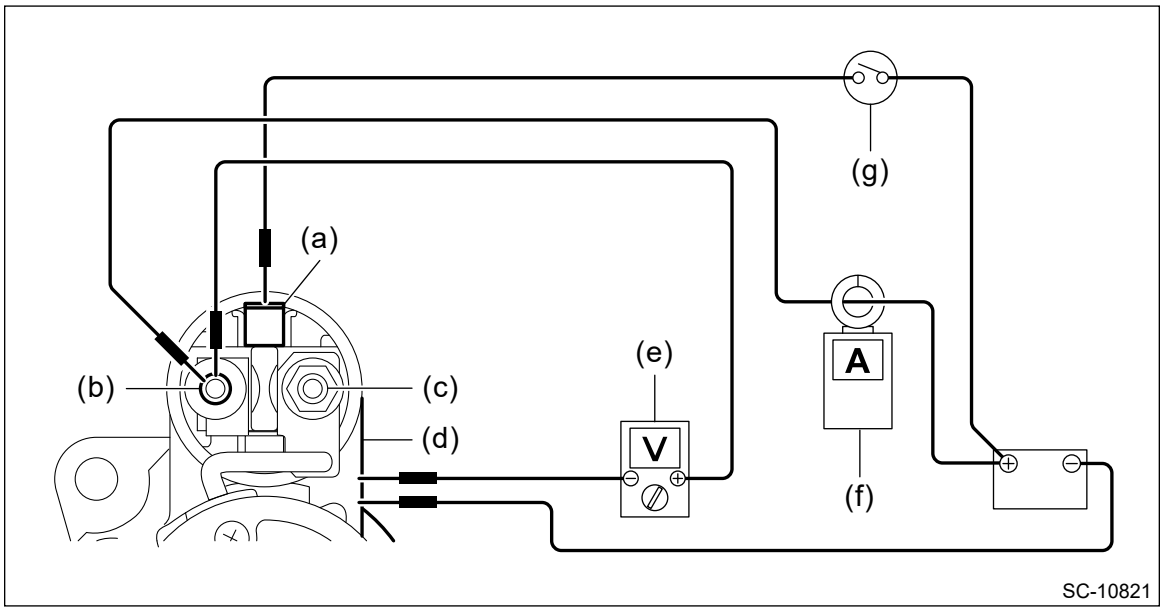
(a) Cable cross-section (b) Cable shield part (c) Cable continuity part

2) It is possible to use a booster cable instead of wiring.

- **Be careful not to burn yourself and cause a fire due to heat.**
- **Perform the no-load test in a short period of time. (Within 3 to 5 seconds)**

Note:

For no-load test, use the circuit shown in figure.



(a) Terminal S
(b) Terminal B
(c) Terminal M
(d) Starter housing
(e) Circuit tester
(f) Circuit tester with clamp-type ammeter
(g) Switch

1. Using a vise, secure the starter.

   Caution:

   Be careful not to deform or damage the starter.
2. Turn the switch ON, and check that the pinion protrudes rapidly into the specified position and rotates powerfully without noise.
3. Check the current and voltage after its rotation speed stabilizes.

   Standard (current/voltage)

   AT model

   90 A or less / approx. 11 V

   MT model

   95 A or less / approx. 11 V

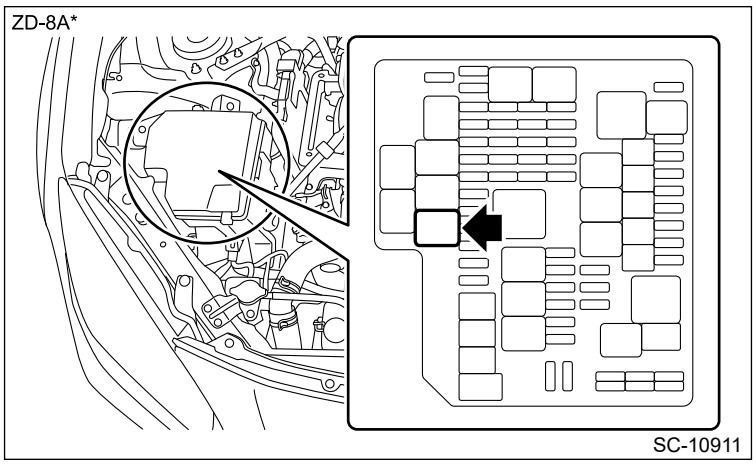
8. OTHER INSPECTIONS

Check that the starter does not have deformation, cracks and any other damage.

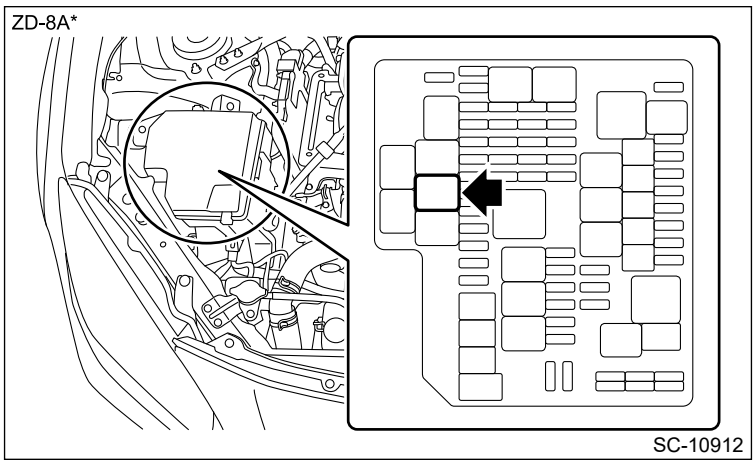
STARTING/CHARGING SYSTEMS(H4DO) > Starter Relay

LOCATION

- Starter relay



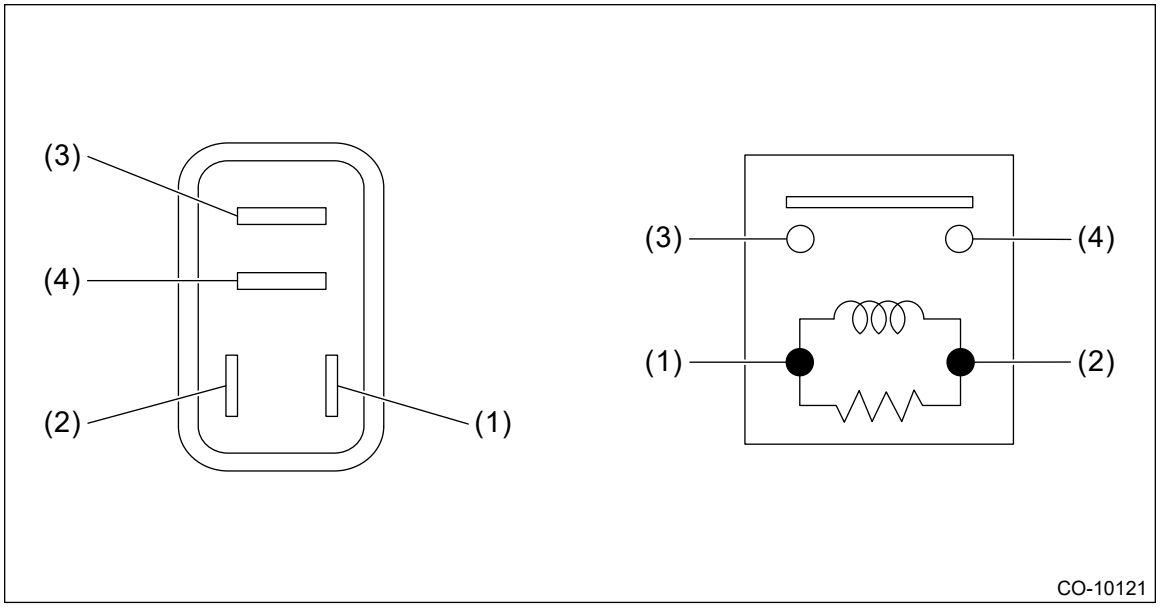
- Starter cut relay



STARTING/CHARGING SYSTEMS(H4DO) > Starter Relay

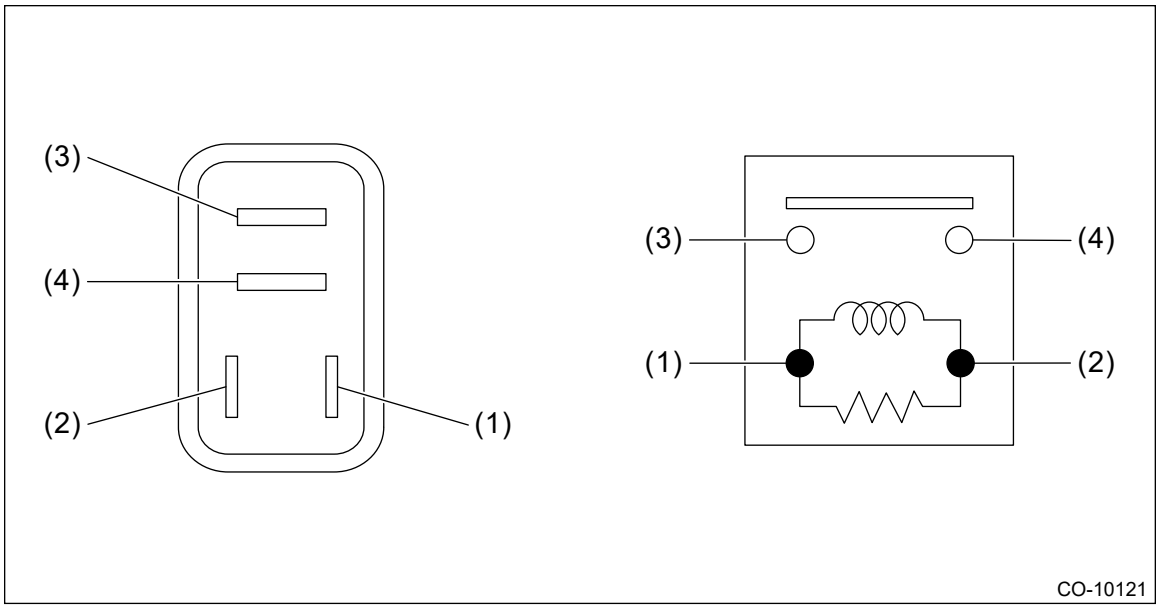
INSPECTION

1. Check that the starter relay and starter cut relay do not have deformation, cracks and any other damage.
2. Measure the resistance between the starter relay and starter cut relay terminals.
   - Starter relay



Terminal No.	Inspection conditions	Standard
3 — 4	Always	1 MΩ or more
3 — 4	Apply battery voltage between terminals 1 and 2.	Less than 1 Ω

- Starter cut relay



Terminal No.	Inspection conditions	Standard
3 — 4	Always	1 MΩ or more
3 — 4	Apply battery voltage between terminals 1 and 2.	Less than 1 Ω

STARTING/CHARGING SYSTEMS(H4DO) > Generator

REMOVAL

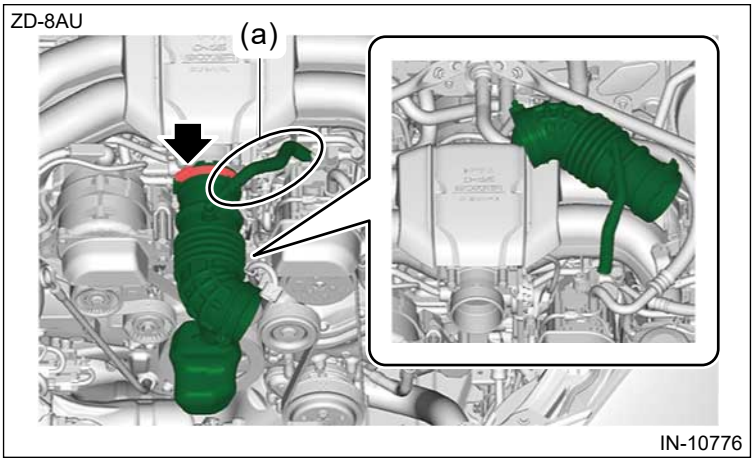
1. Disconnect the ground terminal from battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.
2. Perform the steps below to remove the air intake boot, and place it aside so that it does not interfere with the work.

Caution:
Do not disconnect the PCV hose No. 2 (a).

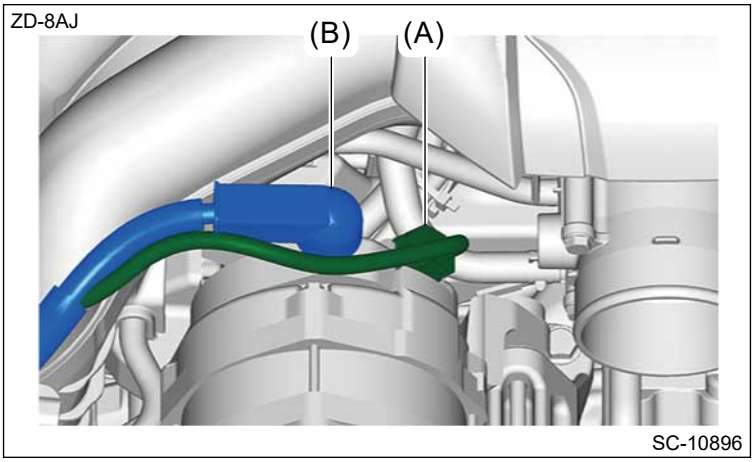
(1) Remove the air cleaner case. Ref. to INTAKE (INDUCTION)(H4DO)>Air Cleaner Case>REMOVAL.

(2) Loosen the clamp, remove the air intake boot, and place it aside so that it does not interfere with the work.

Caution:
Be careful not to pull out the PCV hose No. 2 (a).

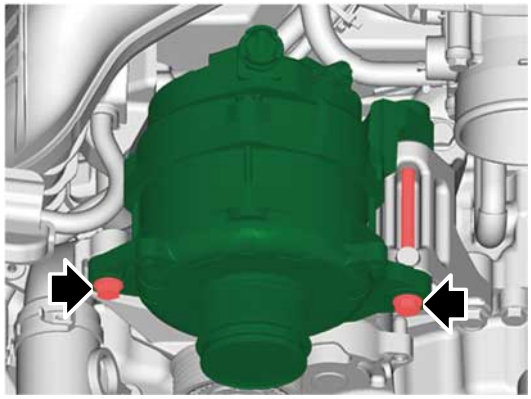


3. Remove the V-belts. Ref. to MECHANICAL(H4DO)>V-belt>REMOVAL > V-BELT.
4. Disconnect the connector (A) and terminal B (B).



5. Remove the generator.

ZD-8AJ



SC-10897

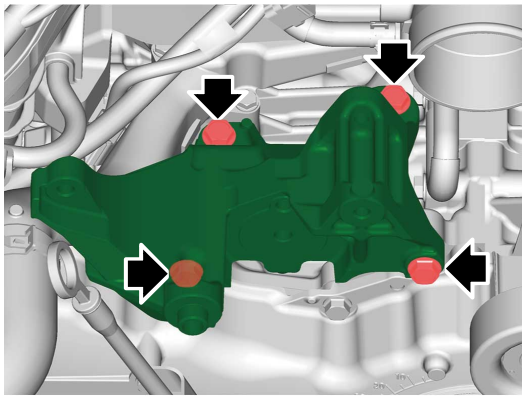
6. Remove the generator bracket.

Note:
Perform this procedure only when required.

(1) Remove the V-belt tensioner assembly. Ref. to MECHANICAL(H4DO)>V-belt>REMOVAL > V-BELT TENSIONER ASSEMBLY.

(2) Remove the generator bracket.

ZD-8AJ



SC-10898

STARTING/CHARGING SYSTEMS(H4DO) > Generator

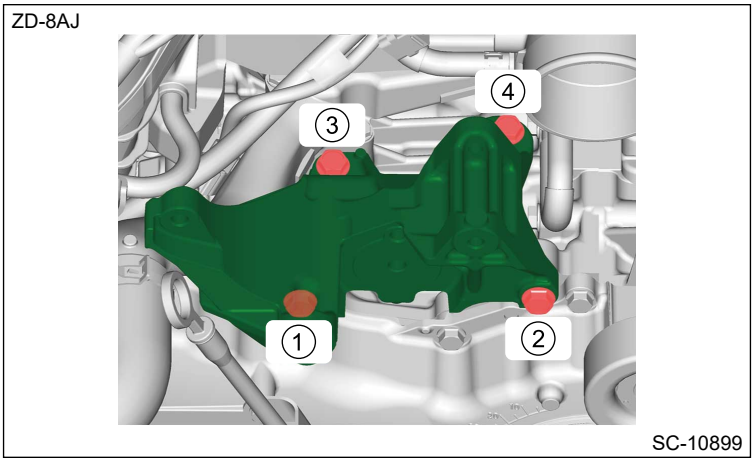
INSTALLATION

1. Install the generator bracket.

(1) Set the generator bracket to the cylinder block RH, and temporarily tighten the bolts which secure the generator bracket.

(2) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)



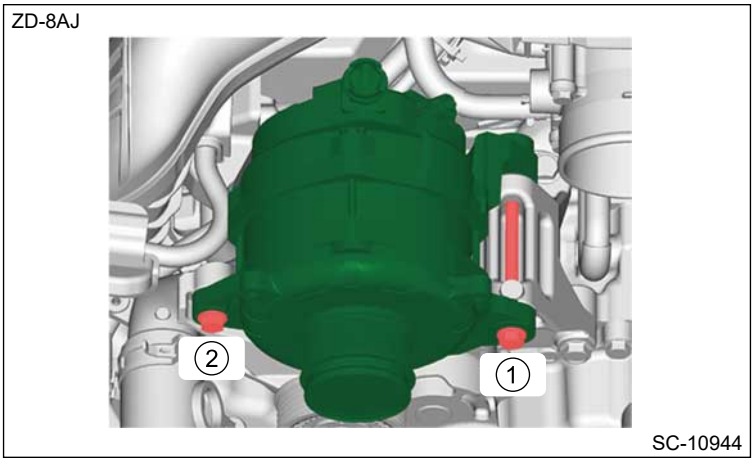
(3) Install the V-belt tensioner assembly. Ref. to MECHANICAL(H4DO)>V-belt>INSTALLATION > V-BELT TENSIONER ASSEMBLY.

2. Set the generator to the generator bracket, and temporarily tighten the bolts which secure the generator.

3. Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:

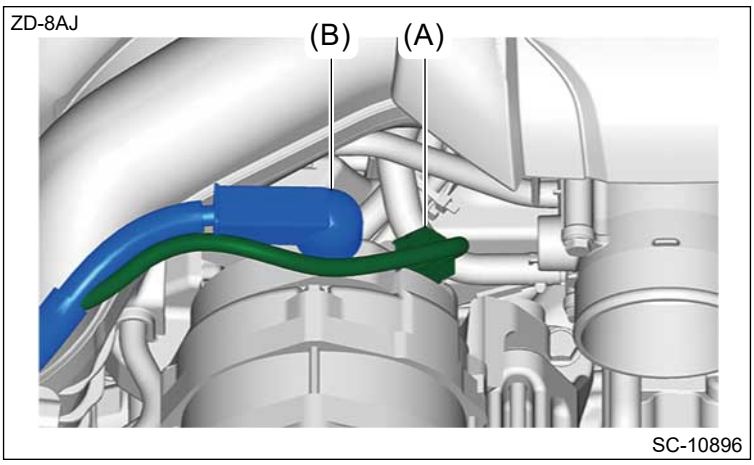
25 N·m (2.5 kgf-m, 18.4 ft-lb)



4. Connect the terminal B (B) and connector (A).

Tightening torque:

15.5 N·m (1.6 kgf-m, 11.4 ft-lb)

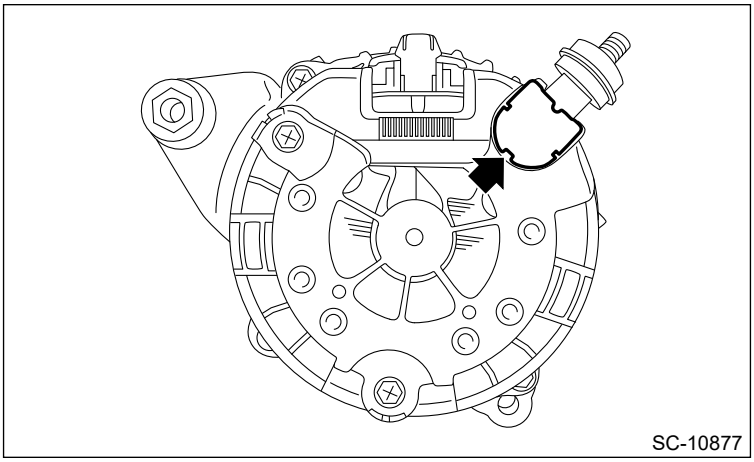


5. Install the V-belts. Ref. to MECHANICAL(H4DO)>V-belt>INSTALLATION > V-BELT.
6. Install the air intake boot. Ref. to INTAKE (INDUCTION)(H4DO)>Air Intake Boot>INSTALLATION.
7. Connect the ground terminal to battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.

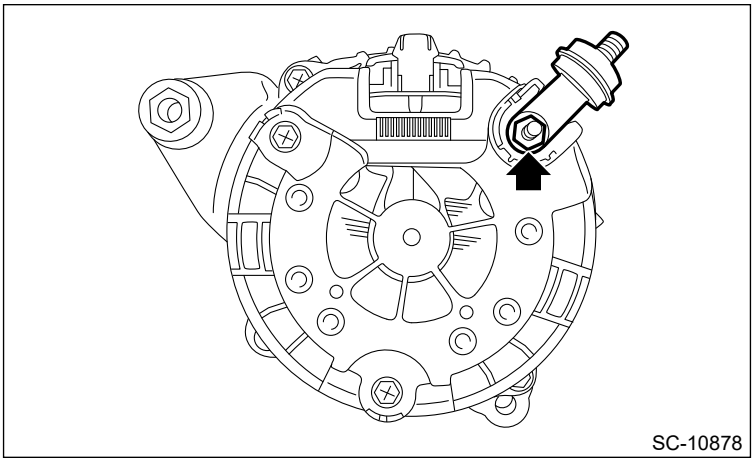
STARTING/CHARGING SYSTEMS(H4DO) > Generator

DISASSEMBLY

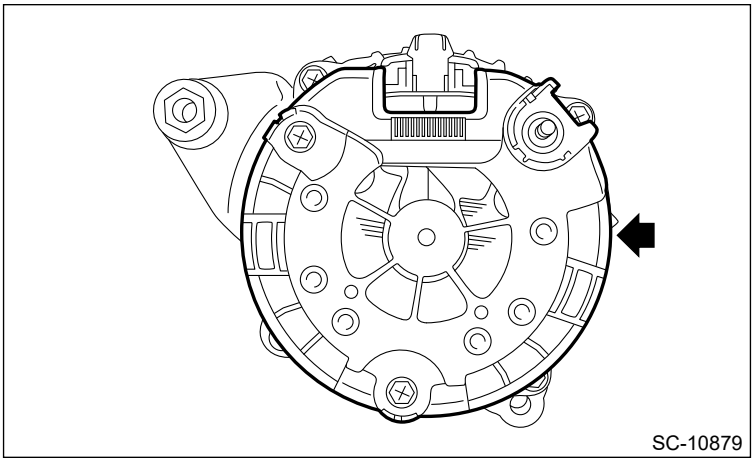
1. Remove the cover.



2. Remove the terminal B.

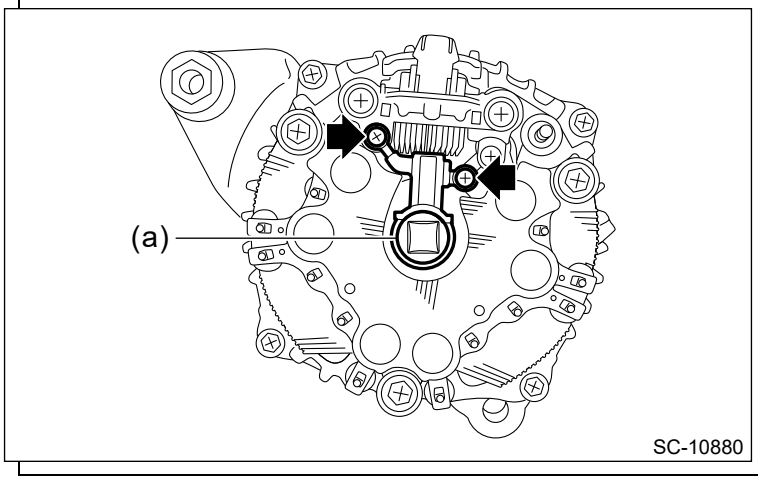


3. Remove the rear cover.

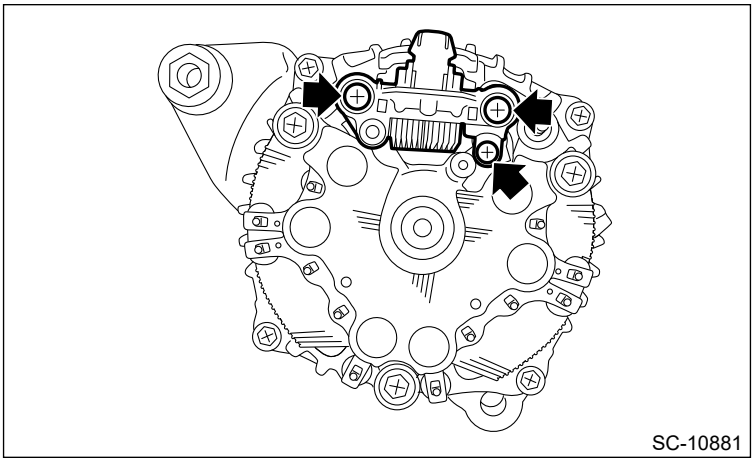


4. Remove the brush holder.

Note:
Set the socket with suitable size etc. (a) to the brush holder, and slide the brush holder toward the socket etc. (a) to remove so that the brush does not pop out.



5. Remove the IC regulator.



STARTING/CHARGING SYSTEMS(H4DO) > Generator

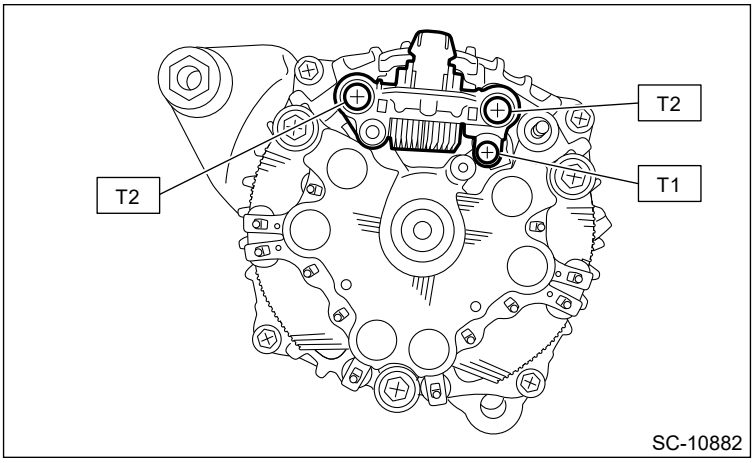
ASSEMBLY

1. Install the IC regulator.

Tightening torque:

T1: 2 N·m (0.2 kgf-m, 1.5 ft-lb)

T2: 3.9 N·m (0.4 kgf-m, 2.9 ft-lb)



2. Install the brush holder.

Note:
Use a socket with suitable size etc. to install the brush while being pushed.

Tightening torque:
2 N·m (0.2 kgf-m, 1.5 ft-lb)

3. Install the rear cover.
4. Install the terminal B.

Tightening torque:
8.9 N·m (0.9 kgf-m, 6.6 ft-lb)

5. Install the cover on the installation location of terminal B.
6. Manually turn the pulley to check that the rotor rotates smoothly.

STARTING/CHARGING SYSTEMS(H4DO) > Generator

INSPECTION

Note:
For the disassembly or assembly procedures required for inspection, refer to "DISASSEMBLY" and "ASSEMBLY" of Generator.

- Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Generator>DISASSEMBLY.
- Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Generator>ASSEMBLY.

1. BRUSH

1. Visually check the brush. If there is any abnormal wear or cracks, replace the brush assembly.
2. Check that the brush moves smoothly in the brush holder.

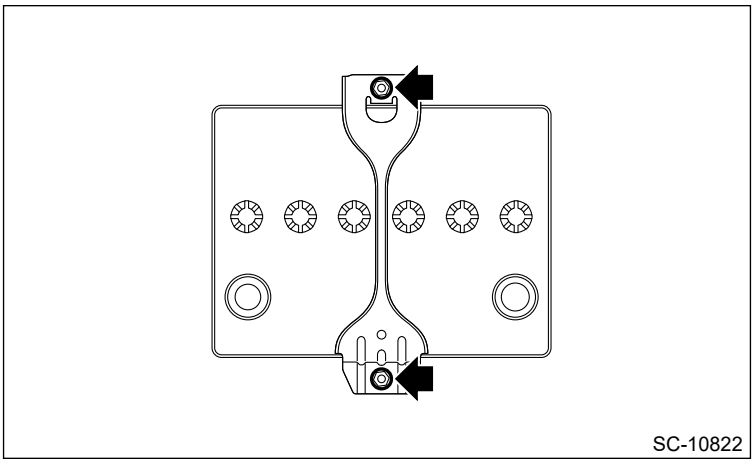
2. OTHER INSPECTIONS

- Check that there is no deformation, cracks or other damages.
- Check that no foreign substances are clogged.

STARTING/CHARGING SYSTEMS(H4DO) > Battery

REMOVAL

1. Disconnect the ground terminal from battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.
2. Disconnect the connector from battery sensor. (When the battery is not replaced)
3. Remove the battery sensor. (When replacing the battery) Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Battery Sensor>REMOVAL.
4. Disconnect the positive terminal of battery.
5. Remove the battery holder.



6. Remove the battery.

STARTING/CHARGING SYSTEMS(H4DO) > Battery

INSTALLATION

Caution:
- **If the battery terminal is worn and the terminal section is loose, replace it with a new battery.**
- **After connecting the ground terminal to the battery sensor, the initial diagnosis of the electronic throttle control is conducted by the vehicle. Therefore, wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.**

1. Install the battery.
2. Install the battery holder.
   Tightening torque:
   3.5 N·m (0.4 kgf-m, 2.6 ft-lb)
3. Connect the positive terminal of battery.
   Tightening torque:
   6 N·m (0.6 kgf-m, 4.4 ft-lb)
4. Install the battery sensor. (When the battery is replaced) Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Battery Sensor>INSTALLATION.
5. Connect the connector to the battery sensor. (When the battery has not been replaced)
6. Connect the ground terminal to battery sensor. Ref. to REPAIR CONTENTS>NOTE > BATTERY.

STARTING/CHARGING SYSTEMS(H4DO) > Battery

INSPECTION

Warning:
- **As batteries produce flammable gases, be careful not to bring an open flame close to the batteries.**
- **Ventilate sufficiently when using or charging battery in enclosed space.**
- **Electrolyte is corrosive acid, and has toxicity; be careful of handling the fluid.**
- **For safety, in case an explosion does occur, wear protective goggles, etc. to shield your eyes when working near any battery. In addition, never lean over the battery.**
- **Be careful that the electrode does not come into contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.**
- **Be careful not to let the electrode contact with the coated parts.**
- **Before starting work, remove rings, metal watch-bands, and other metal jewelry.**
- **Be careful not to let the metal tools contact the positive battery terminal and anything connected to it. When the operation using a metal tool to the positive terminal or anything connected to it is required, disconnect the ground terminal from the battery sensor before starting the operation.**

1. APPEARANCE

Check the battery case, top cover and terminals for dirt or cracks, and perform the following work as necessary.
- Clean the battery with water and wipe with a dry cloth.
- Apply a thin coat of anti-rust grease on the terminals to prevent corrosion.

Check
- **Normal** → Go to the check item 2.
- **Abnormal** → Replace the battery.

2. ELECTROLYTE LEVEL

Check the electrolyte level in each cell.

Caution:
Do not fill beyond MAX level.

Note:
If the level is below the middle point between MIN level and MAX level, pour distilled water into the battery cell to bring the level to MAX.

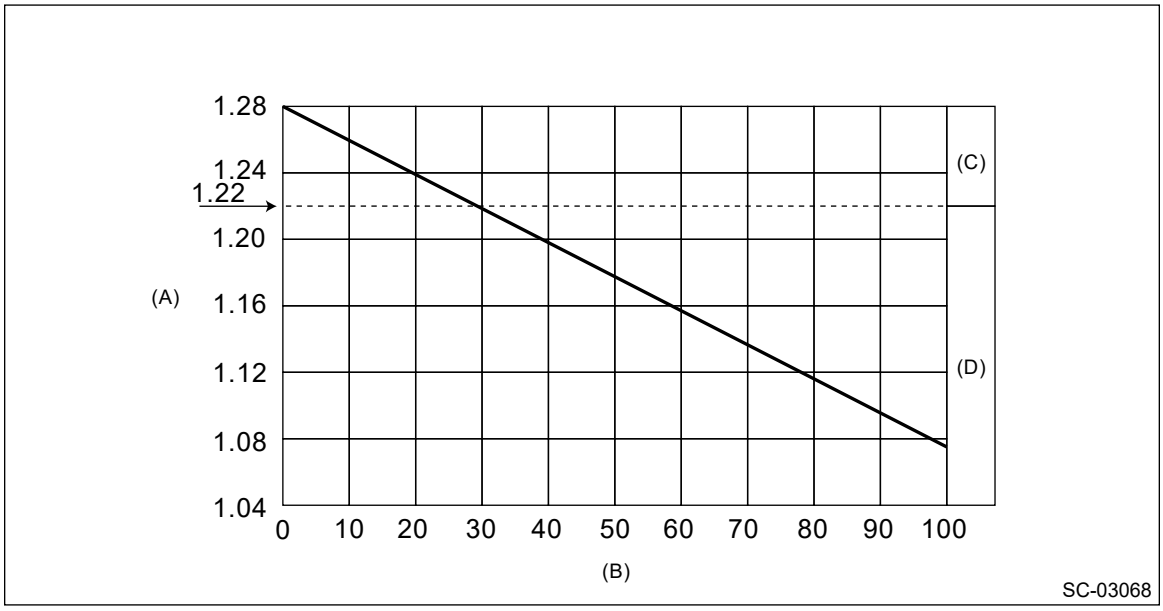
Check
- **MAX level** → Go to the check item 3.
- **Below the middle point between MIN level and MAX level** → Fill → Go to the check item 3.

3. SPECIFIC GRAVITY OF ELECTROLYTE

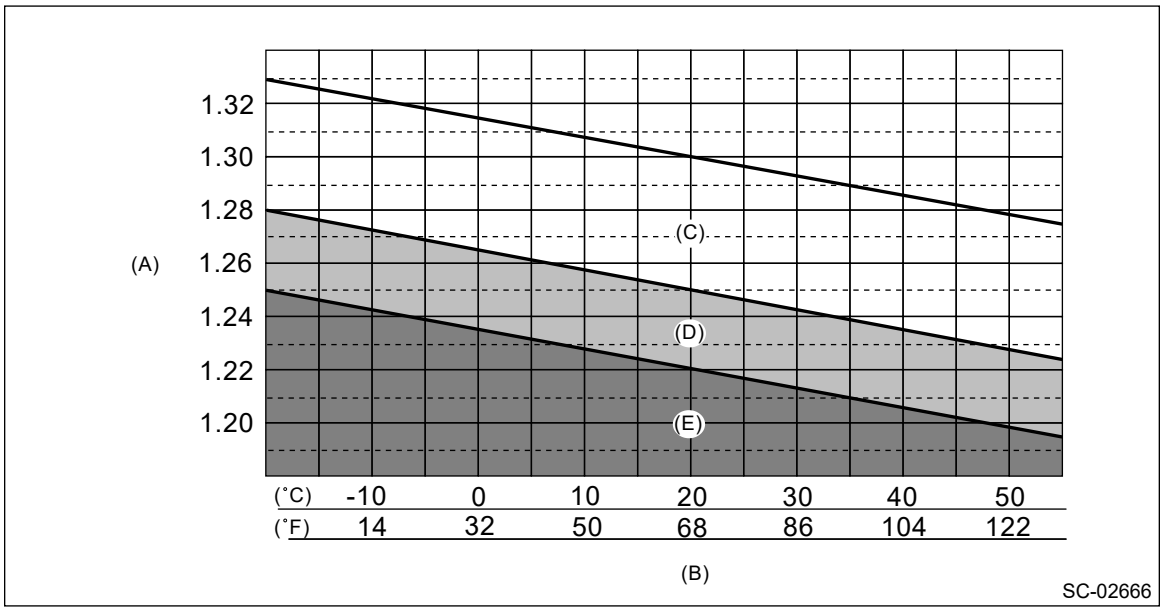
Check the specific gravity of the electrolyte using a hydrometer and a thermometer.

Note:

- **Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following calculation:**
  S_{20} = St + 0.0007 × (t − 20)
  S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
  St: Measured specific gravity
  t: Measured temperature (°C)
- **When measuring in a simplified manner using the battery terminal voltage, calculate the specific gravity by the following formula.**
  Specific gravity = [0.187 × battery terminal voltage (V)] − 1.1
  Perform the following steps before measuring the voltage in order to stabilize the battery voltage.
  1) Turn the ignition switch to OFF and illuminate the headlight for 30 seconds.
  2) After turning off the headlight, leave the vehicle for one minute.
- **Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between specific gravity and state of charge is as shown in the figure.**



(A) Specific gravity [20°C (68°F)] (C) Good (D) Need to charge or replace
(B) Amount of discharge (%)



(A) Specific gravity [20°C (68°F)] (C) Good (E) Need charging
(B) Electrolyte temperature (D) Caution

Check

- **Specific gravity: 1.250 — 1.290, and difference between cells is 0.04 or less** → Battery is normal
- **Specific gravity: Less than 1.250, or difference between cells is 0.04 or more** → Battery needs to be charged or replaced

4. STANDBY CURRENT

1. Prepare the circuit tester which can measure down to 1 mA.

Note:
For model with keyless access function, the standby current changes regularly. Therefore, prepare the analog type circuit tester.

2. Using the circuit tester, check the standby current.

Note:
The standby current may be displayed lower than the actual value if the battery is weak, so charge or replace the battery as necessary.

(1) Check the battery.

Appearance:

Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Battery>INSPECTION > APPEARANCE.

Electrolyte level:

Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Battery>INSPECTION > ELECTROLYTE LEVEL.

Specific gravity of electrolyte:

Ref. to STARTING/CHARGING SYSTEMS(H4DO)>Battery>INSPECTION > SPECIFIC GRAVITY OF ELECTROLYTE.

(2) Check that the fuse is not blown out and is properly inserted.

(3) When non-genuine electrical parts (including parts sold in authorized workshops) are installed, remove all parts.

(4) Make sure that the delivery mode fuse is inserted. Ref. to PRE-DELIVERY INSPECTION>PRE-DELIVERY INSPECTION (PDI) PROCEDURE > FUSE INSTALLATION.

(5) Start the engine, and set the switch positions for each system as shown in the following table.

Note:
Some of the listed systems are not equipped depending on the vehicle. Set only the systems equipped on the vehicle to the positions as shown.

System	Position
Headlight	ON or Auto
Fog light	ON
Wiper (front and rear)	ON or Low speed
Audio and navigation system	ON
Rear defogger	ON
Room light	DOOR
Luggage light	DOOR
Map light	OFF
Auto A/C	ON (AUTO)
Manual A/C	ON (Speed 1)
Electronic parking brake	ON
Electrical parts other than listed above (electrical parts that users can confirm the operation with the key removed)	OFF

(6) Turn the ignition switch to OFF.

(7) Operate the front hood lock release lever to unlock the front hood.

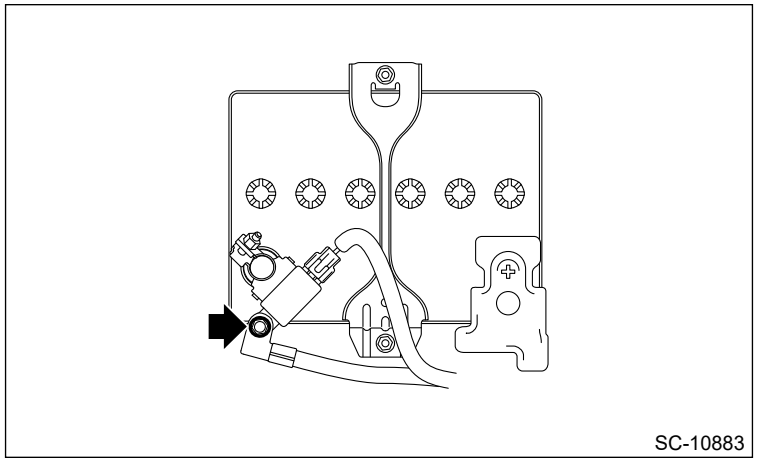
(8) Close all the doors (including trunk lid) and then lock the doors. (Security alarm is in set condition)

Note:
For model with keyless access function, take the access key 1.5 m or more away from the vehicle after the door lock. And do not put the access key close to the vehicle while measuring the standby current.

(9) Wait for 5 minutes after door lock until the standby current stabilizes.

(10)Loosen the nut which holds the ground terminal to the battery sensor.

Note:
Do not remove the ground terminal.

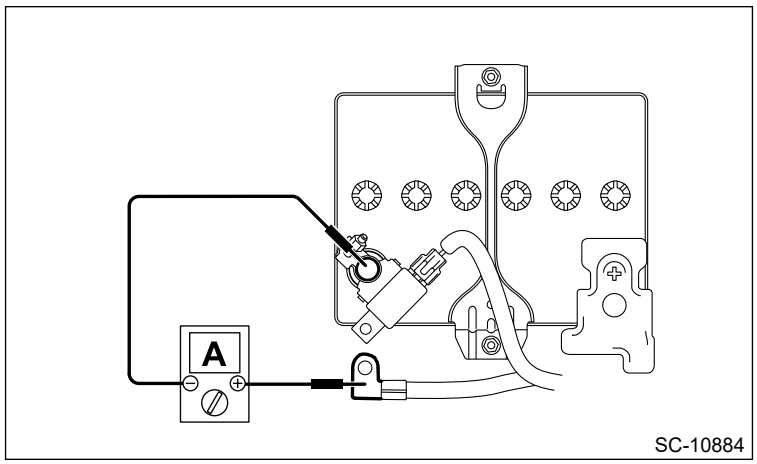

SC-10883

(11)Connect the circuit tester positive terminal to the ground terminal.

Note:
To prevent the damage to the circuit tester, set the circuit tester range to a large value first, then gradually change it to smaller values.

(12)Connect the circuit tester negative terminal to the ground terminal installation part of the battery sensor.

(13)While connecting the circuit tester positive terminal with the ground terminal as shown in the figure, remove the ground terminal from the battery sensor.



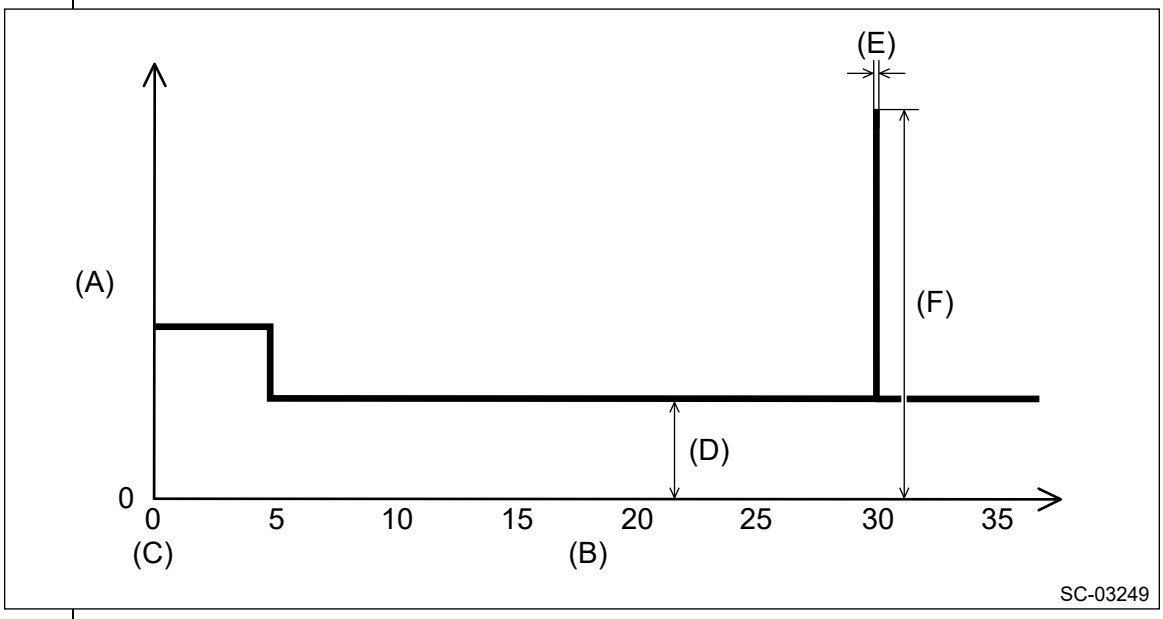
SC-10884

(14)Check the standby current.

Caution:
If the terminals and circuit tester are detached during standby current inspection, reconnect the ground terminal to the battery sensor and repeat the procedure from step (9).

Note:

- **For model with keyless access function, the standby current changes periodically because the keyless access system continuously searches the access key (polling).**
- **When measuring the standby current, the reading of the circuit tester oscillates. Therefore, read the average value (median value).**
- **The standby current may become large when the vehicle system (ELCM) is activated 5 times at 30-minute intervals or 5 hours after turning the ignition switch to OFF. Therefore, the measurement should be completed in 20 minutes after the ignition switch is turned to OFF.**
  If it takes more than 20 minutes, start the engine once, turn the ignition switch to OFF again, then perform the inspection.



(A) Current/mA
(B) Time/min
(C) Ignition OFF
(D) Less than 70 mA
(E) 5 seconds (system operation)
(F) 300 mA or more

Check

- **When the maximum measurement value is less than 70 mA** → Standby current is normal.
- **When the maximum measurement value is 70 mA or more** → Go to step (15).

(15)Connect the ground terminal to the battery sensor, and wait for 55 minutes.

Note:

For 55 minutes after turning the ignition switch to OFF, the vehicle system (EPS) may still be active.

(16)Measure the standby current with the same measurement procedures as in steps (10) through (14).

Check

- **When the maximum measurement value is less than 70 mA** → Standby current is normal.
- **When the maximum measurement value is 70 mA or more** → Go to step (17).

(17)Remove all fuses one by one to identify which system changes the standby current value significantly. Ref. to WIRING SYSTEM>Power Supply Circuit.

(18)Check the related part, harness and connector of the system whose standby current has changed significantly.

STARTING/CHARGING SYSTEMS(H4DO) > Battery

CHARGE

Warning:
- **Do not bring an open flame close to the battery.**

Caution:
- **If the terminals are corroded, clean with a brush and common caustic soda solution.**
- **As batteries produce flammable gases while charging, be careful not to bring an open flame close to the batteries.**
- **Ventilate sufficiently when charging batteries.**
- **Observe instructions when handling the battery charger.**
- **Before charging the battery on the vehicle, disconnect the ground terminal from the battery sensor to prevent damage of generator diodes or other electrical units.**

1. NORMAL CHARGE (CONSTANT CURRENT CHARGE)

Charge the battery with the current value specified by manufacturer or with approximately 1/10 of battery's rating capacity. (See the table below.)

Type	Charging current (A)	CCA (A)
55D23L	4.0 — 5.0	390
75D23L	5.0 — 6.0	470

Caution:
- **The charge control feature and specifications for judgment of charge completion depend on the device. Follow the instruction manual of the charger used.**
- **Keep the electrolyte temperature at 45°C (113°F) or less while charging. Stop charging when the temperature exceeds this value.**

Note:
The characteristics of typical charging methods are as follows.
- **Constant current charging**
  This method makes it easy to charge to 100%, since the electrolyte is agitated by the gassing occurred at the end of charging. However, the time for charging is comparatively long because the current value is kept constant.
- **Constant voltage charging**
  This method completes charging in a short period of time due to the large current. However, it is difficult to charge to 100% because no gassing occurred at the end of charging and the electrolyte is not agitated. Therefore, the combined use with the constant current charging is preferable.
- **Quasi-constant voltage charging**
  This method is widely used for commercially available chargers.
  Compared to the constant voltage charging whose charging current at the beginning of charging becomes large, it reduces the charging current by lowering the voltage at the initial stage, resulting in battery load reduction. The time for charging is comparatively long. However, this type of chargers can be manufactured comparatively inexpensive due to the simple control circuit (or manual settings). After the initial stage of charging is completed, it gradually raises the charging voltage so that the charging current is within the specification, until the battery is fully charged.
- **Constant voltage/current charging**
  In addition to the constant voltage charging, this method controls the upper limit of the current.
  The constant current charging is applied at the beginning of charging, and the constant voltage charging is applied at the end. This makes battery charge comparatively efficient in a short period of time. Charging by generators is similar to this method.

Judgment of charge completion

1. Specific gravity of electrolyte should be held within the specific range of 1.250 — 1.290 for one hour or more.
2. Voltage while charging should be held within the specified range of 15.0 — 16.8 V for one hour or more.
3. Gas is actively generated in all cells.
4. The amount of charge reaches 1.2 — 1.5 times of the amount of discharge.

Note:
The amount of discharge/charge can be calculated by the following formula.
Amount of discharge (Ah) = remaining capacity calculated by specific gravity (%) × 5 hour rate capacity (Ah)
Amount of charge (Ah) = Charging current value (A) × Time for charging

2. QUICK CHARGING

Charge the battery in a short period of time with a relatively large current by using a quick charger. Charge the battery with the current value at approximately 1/2 of battery’s rating capacity. (See the table below.)

Caution:

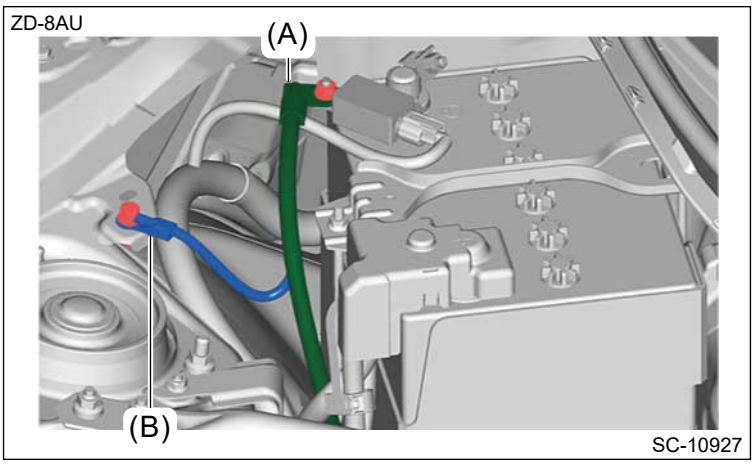
- **Quick charging is accompanied by a large amount of heat generation. Charging should be completed in up to 30 minutes regardless of battery size.**
- **Quick charging is used to recover the battery until it can start the vehicle. For full charging, use the normal charging method.**
- **Keep the electrolyte temperature at 55°C (131°F) or less while quick charging. Stop charging when the temperature exceeds this value.**

Type	Charging current (A)	CCA (A)
55D23L	20.0 — 25.0	390
75D23L	24.0 — 29.0	470

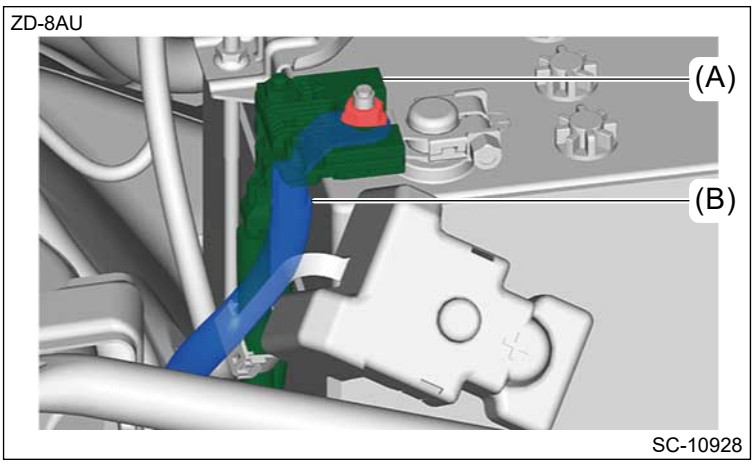
STARTING/CHARGING SYSTEMS(H4DO) > Battery Cable Assembly

REMOVAL

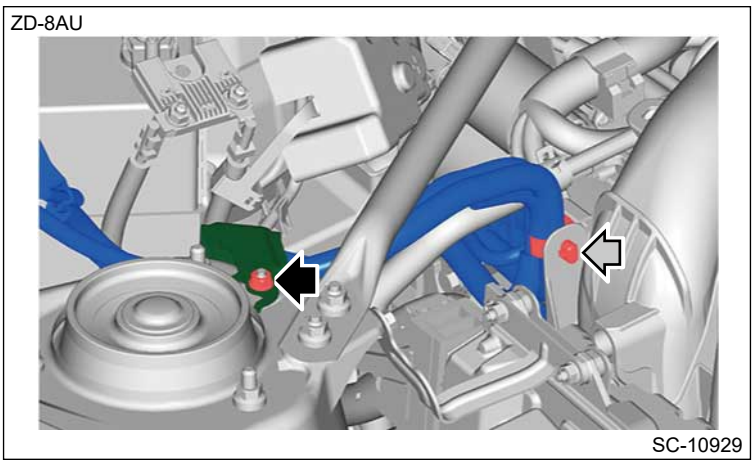
1. Disconnect the ground terminal (A) and ground terminal (B).



2. Disconnect the slow blow fuse (A) from the terminal base, and remove the terminal (B).

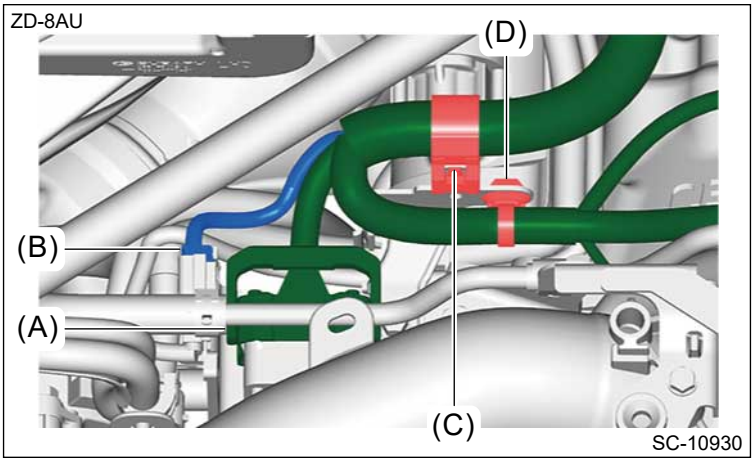


3. Remove the bolt securing the bracket and remove the clip securing the battery cable assembly.

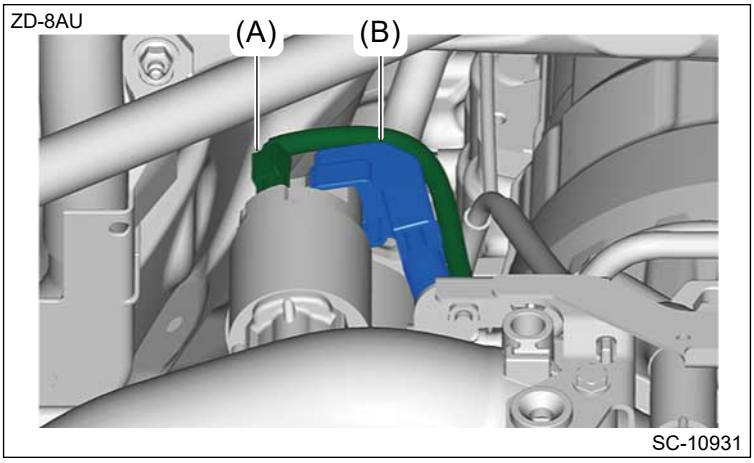


4. Remove the collector cover. Ref. to FUEL INJECTION (FUEL SYSTEMS)(H4DO)>Collector Cover>REMOVAL.
5. Remove the connector (A) and connector (B).

6. Remove the clip (C) and clip (D) securing the bulkhead wiring harness, and place it aside so that it does not interfere with work.

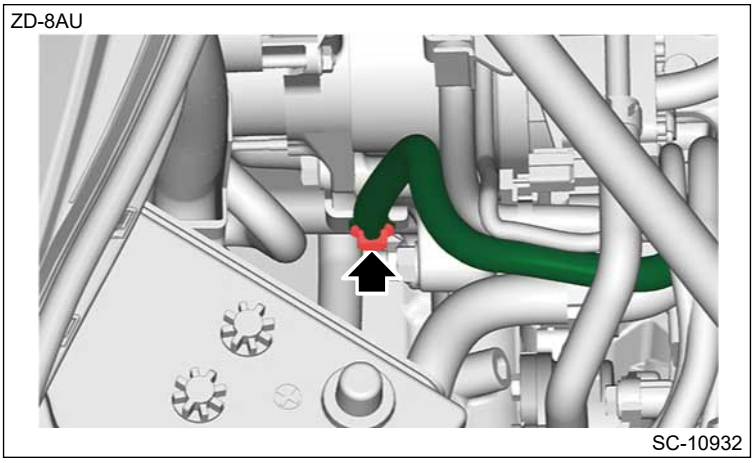


7. Disconnect the connector (A) and terminal B (B).



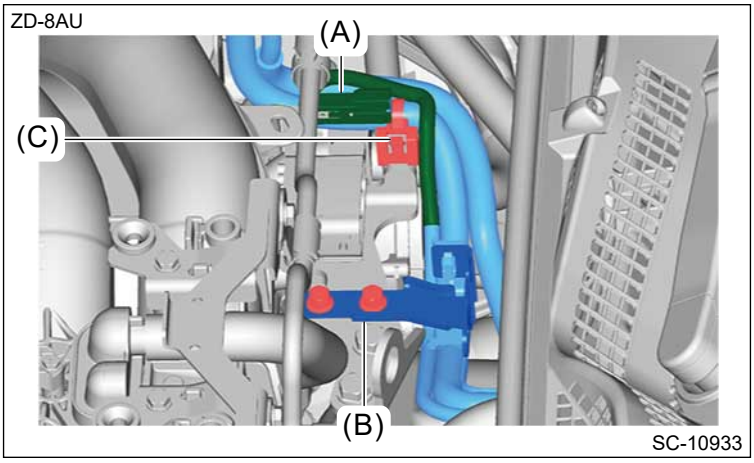
8. Disconnect the ground terminal.

Note:
In order to prevent damaging the ground terminal, fix the ground terminal when loosing the bolt, and avoid the part from rotating together while loosening the bolt.

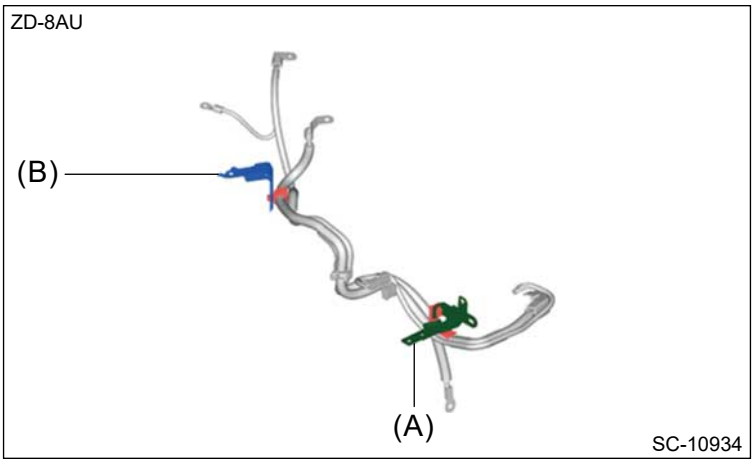


9. Remove the connector (A) and bracket (B) from the engine rear hanger.

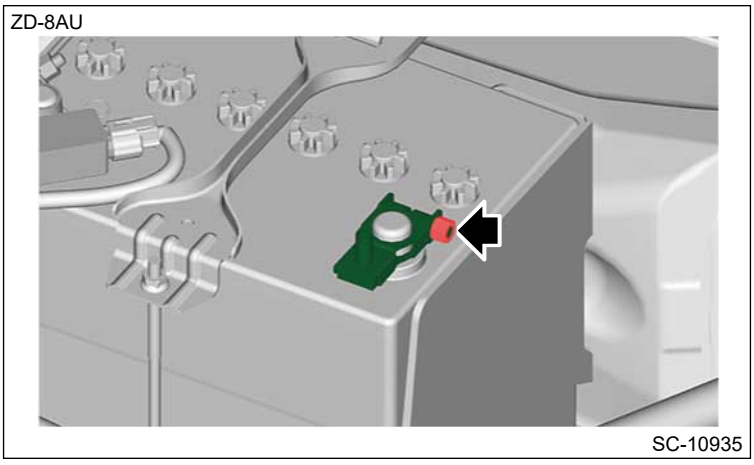
10. Remove the clip (C) and remove the battery cable assembly.



11. Remove the bracket (A) and bracket (B) from the battery cable assembly.

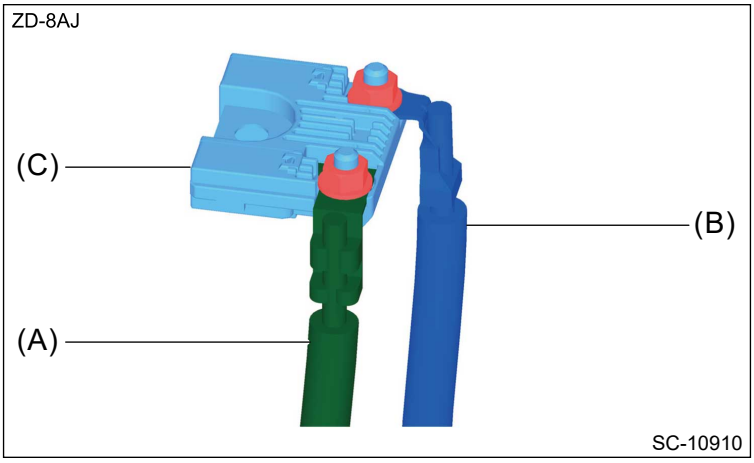


12. Remove the terminal base.



13. Disconnect the terminal (A) and the terminal (B), and remove the slow blow fuse (C).

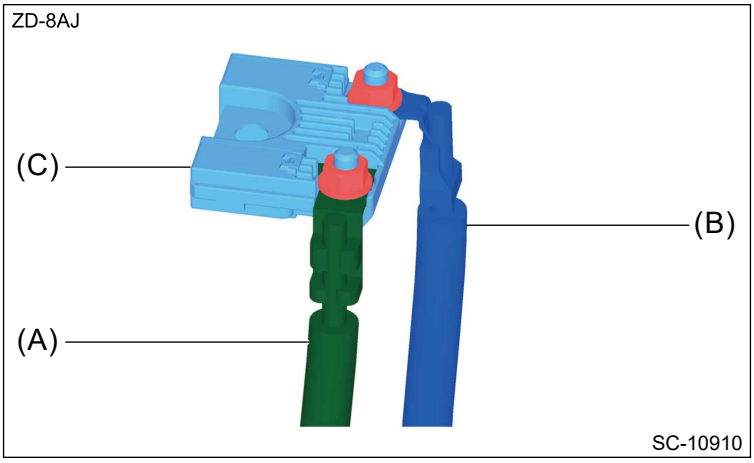
Note:
Perform this procedure only when required.



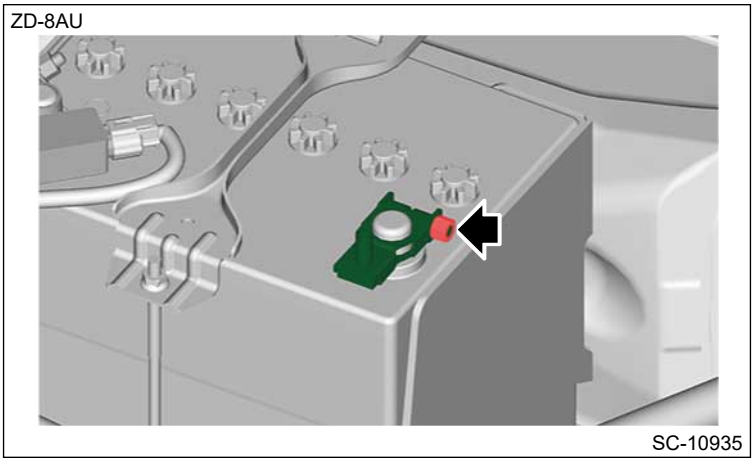
STARTING/CHARGING SYSTEMS(H4DO) > Battery Cable Assembly

INSTALLATION

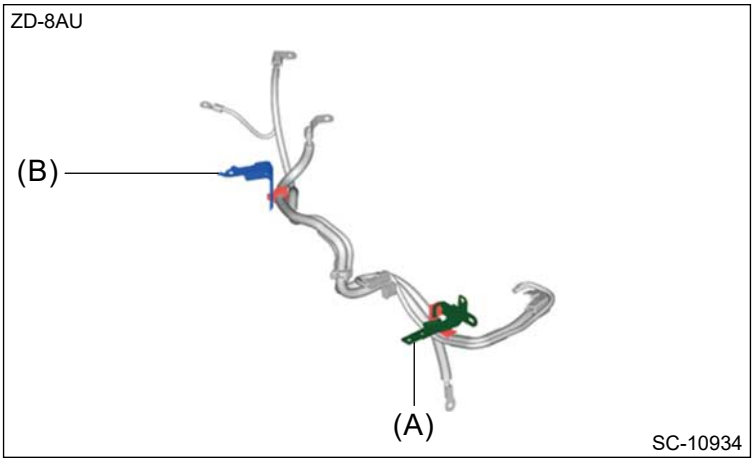
1. Connect the terminal (B) and the terminal (A) to the slow blow fuse (C).
   Tightening torque:
   5.5 N·m (0.6 kgf-m, 4.1 ft-lb)



2. Install the terminal base.
   Tightening torque:
   6 N·m (0.6 kgf-m, 4.4 ft-lb)



3. Install the bracket (B) and bracket (A) to the battery cable assembly.

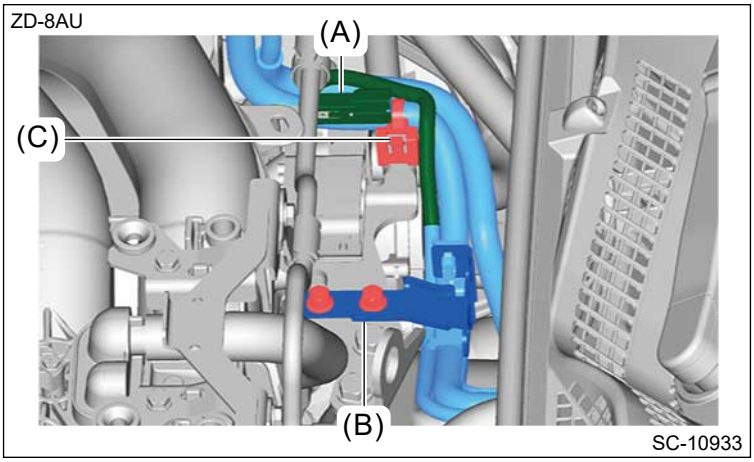


4. Set the battery cable assembly and secure it with the clip (C).

5. Install the bracket (B) and connector (A) to the engine rear hanger.

Tightening torque:

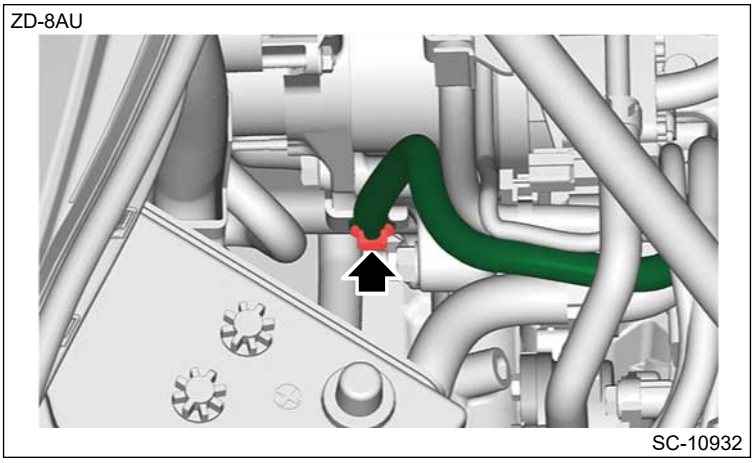
10 N·m (1.0 kgf-m, 7.4 ft-lb)



6. Connect the ground terminal.

Tightening torque:

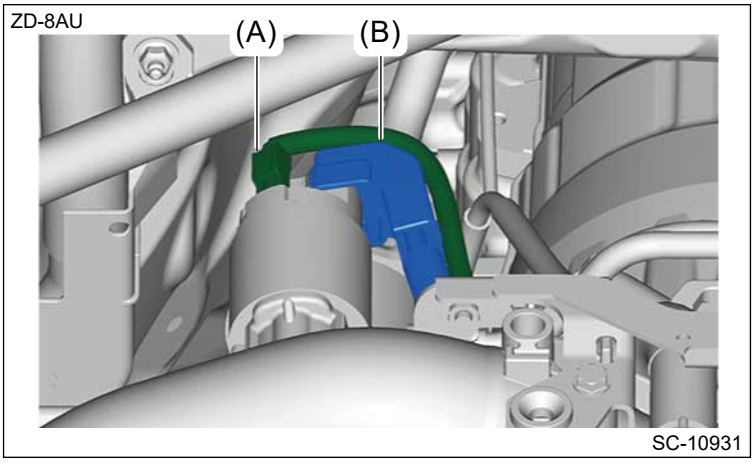
14 N·m (1.4 kgf-m, 10.3 ft-lb)



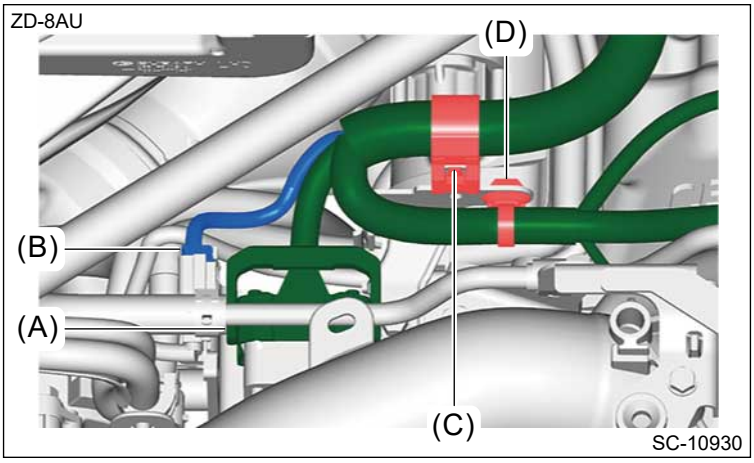
7. Connect the terminal B (B) and connector (A).

Tightening torque:

11 N·m (1.1 kgf-m, 8.1 ft-lb)



8. Secure the bulkhead wiring harness with clip (D) and clip (C), and connect connector (B) and connector (A).

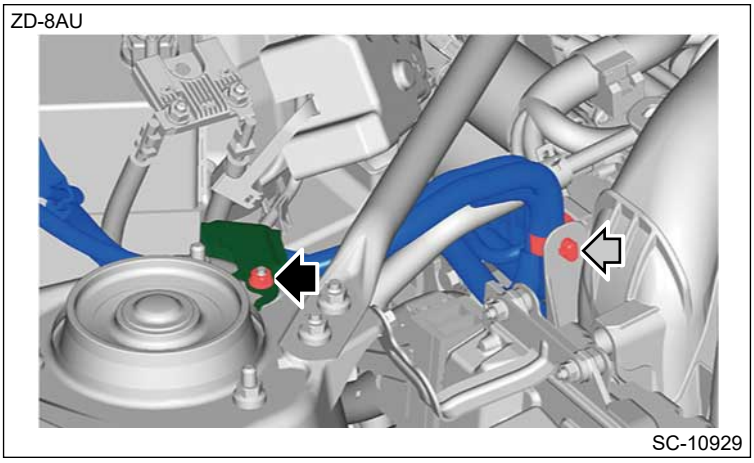


9. Install the collector cover. Ref. to FUEL INJECTION (FUEL SYSTEMS)(H4DO)>Collector Cover>INSTALLATION.

10. Secure the battery cable assembly with the clip and install the bracket.

Tightening torque:

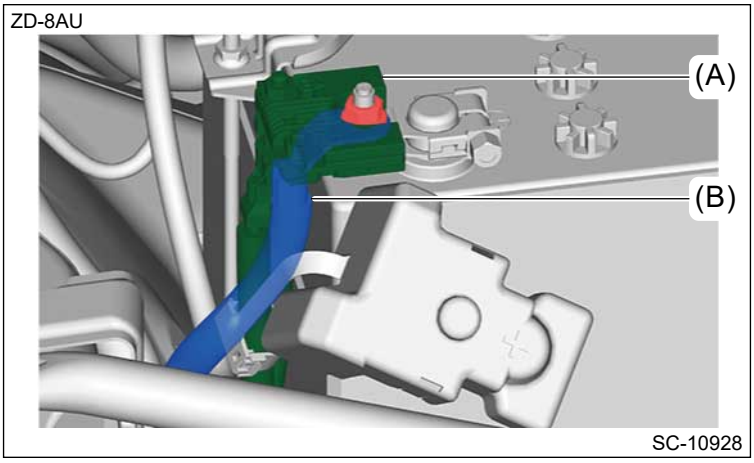
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



11. Set the terminal (B) to the terminal base, and connect the slow blow fuse (A).

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

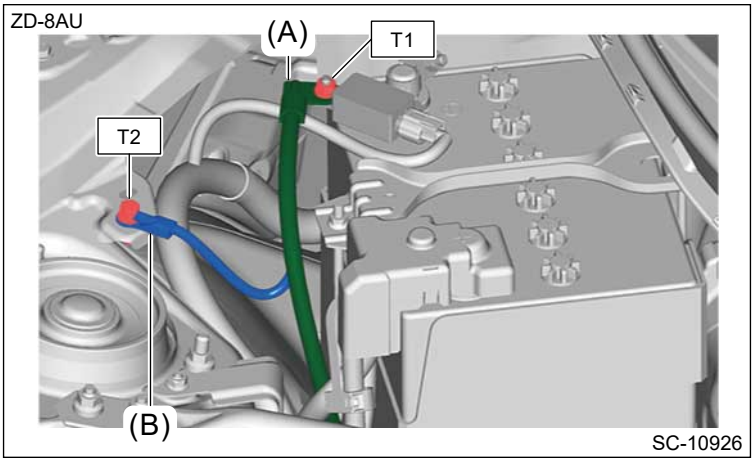


12. Connect the ground terminal (B) and ground terminal (A).

Tightening torque:

T1: 7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



STARTING/CHARGING SYSTEMS(H4DO) > Battery Cable Assembly

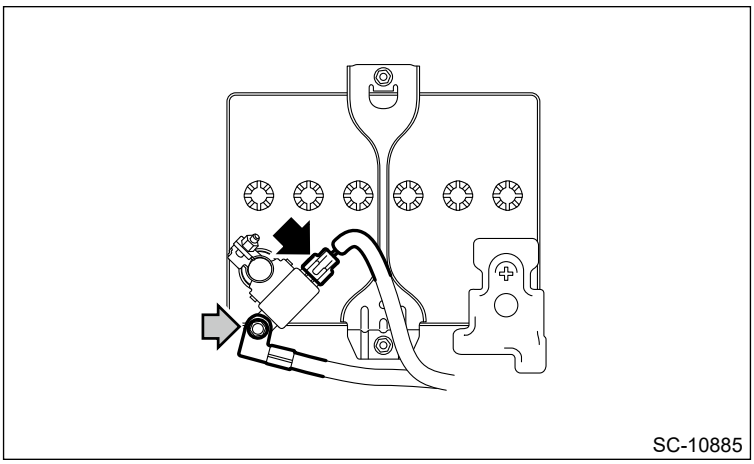
INSPECTION

Check that the battery cable assembly has no deformation, cracks or other damages.

STARTING/CHARGING SYSTEMS(H4DO) > Battery Sensor

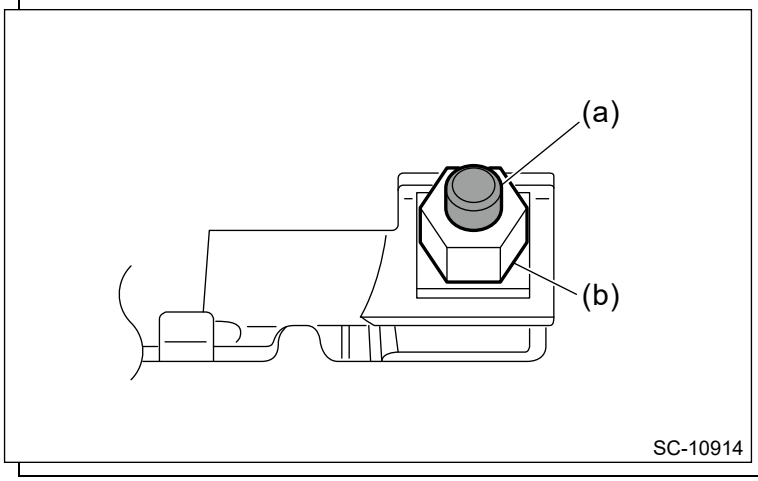
REMOVAL

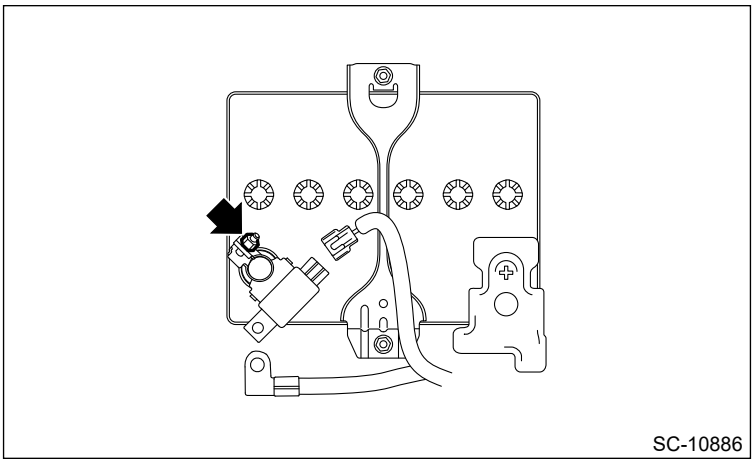
1. Disconnect the connector and ground terminal.



2. Remove the battery sensor.

Caution:
The end of the bolt (a) of the battery sensor is crimped. Therefore, do not loosen the nut (b) to the crimped portion.





STARTING/CHARGING SYSTEMS(H4DO) > Battery Sensor

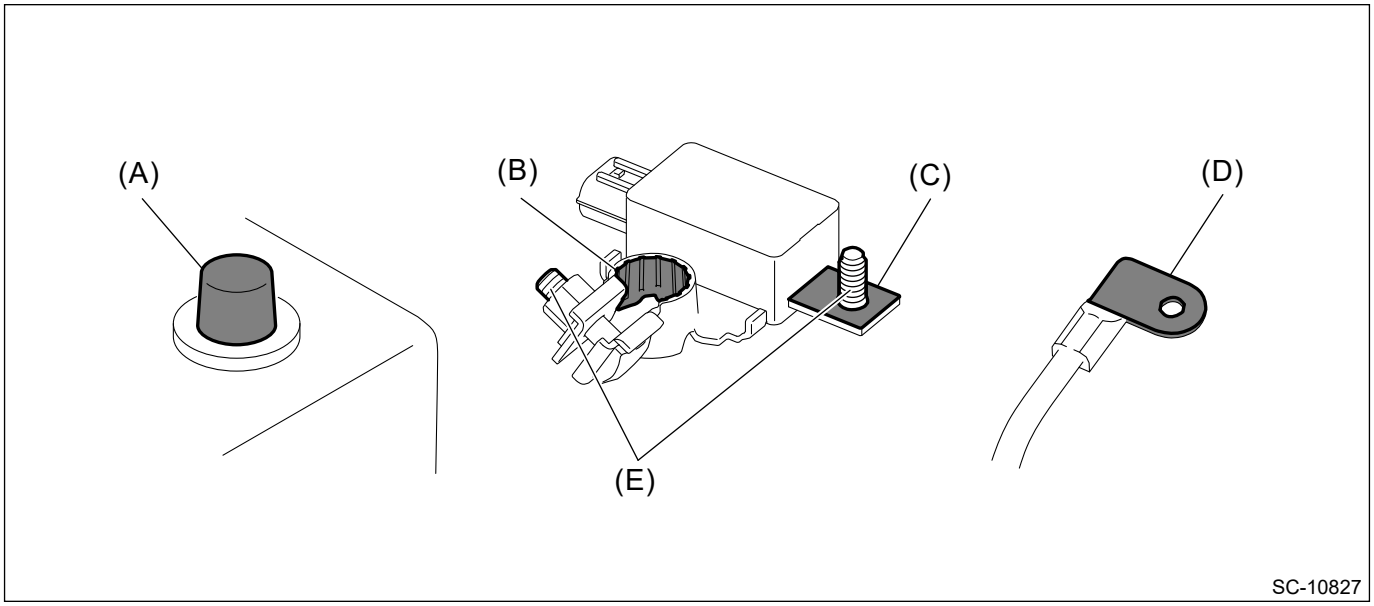
INSTALLATION

Caution:
- **If the battery terminal is worn and the terminal section is loose, replace it with a new battery.**
- **After connecting the ground terminal to the battery sensor, the initial diagnosis of the electronic throttle control is conducted by the vehicle. Therefore, wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.**

1. Install the battery sensor.

(1) Clean and degrease the battery terminal, inside of the battery sensor terminal, ground terminal connecting area, and ground terminal.

Caution:
As residual anti-rust grease on the bolt thread may cause overtorque, clean and degrease the thread if anti-rust grease remains on it. Also, be careful to avoid battery sensor deformation and intrusion of anti-rust grease into the inside of the connector when wiping.



(A) Battery terminal
(B) Inside of the battery sensor terminal
(C) Ground terminal connecting area and ground terminal
(D) Ground terminal
(E) Bolt thread

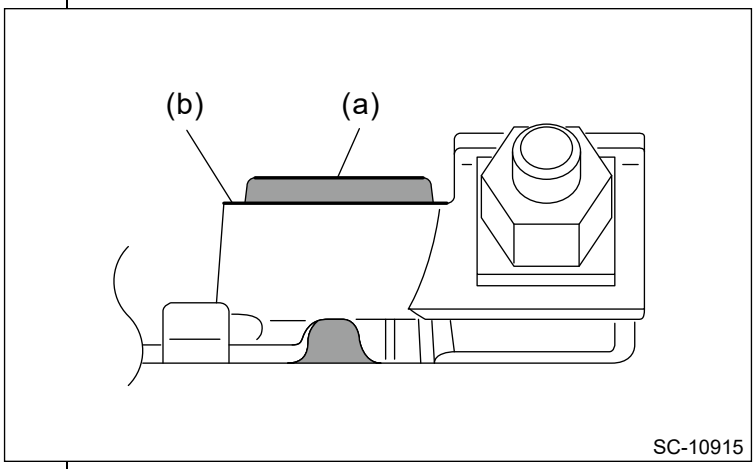
(2) Loosen the battery sensor nut up to just before the crimp to make sure that the clamp is open.

Note:
This operation is required to firmly insert the battery sensor into the battery terminal.

(3) Set the battery sensor to the battery terminal, and tighten the nut.

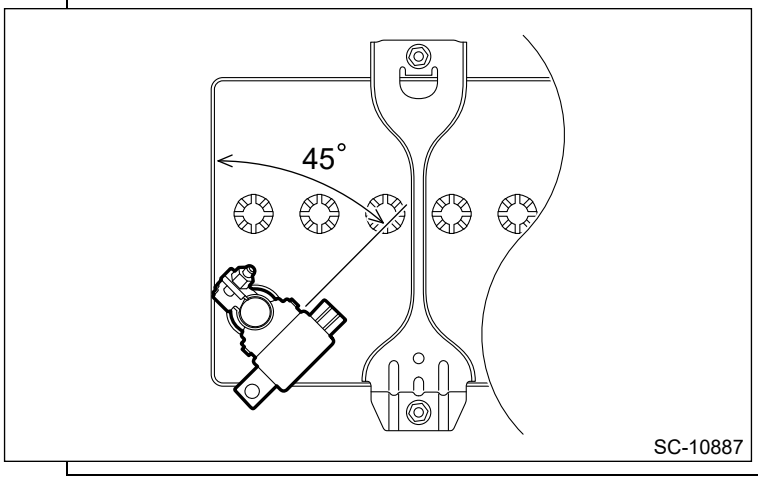
Caution:

Insert until the battery terminal upper end (a) exceeds the height of the battery sensor terminal upper end (b).



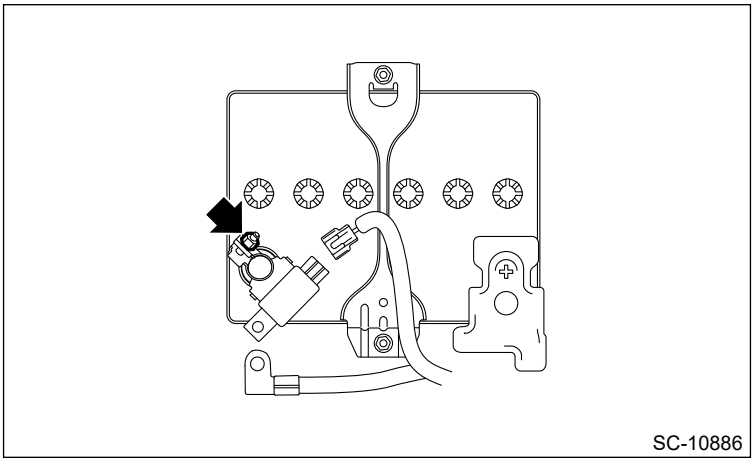
Note:

Install the battery sensor at the angle as shown in the figure.



Tightening torque:

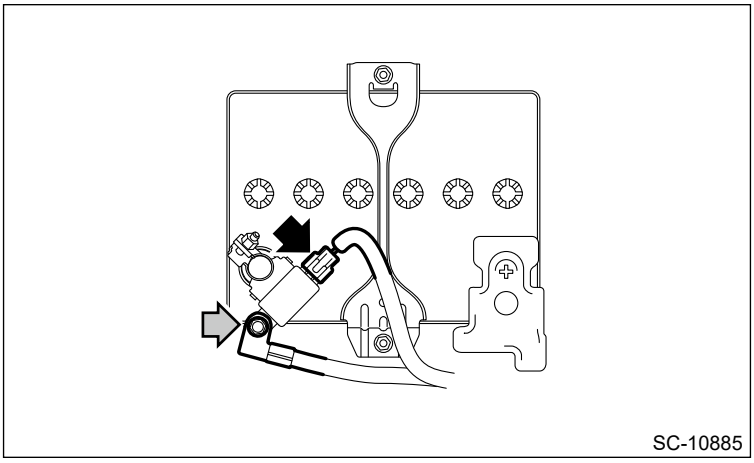
6 N·m (0.6 kgf-m, 4.4 ft-lb)



2. Connect the connector and ground terminal to the battery sensor.

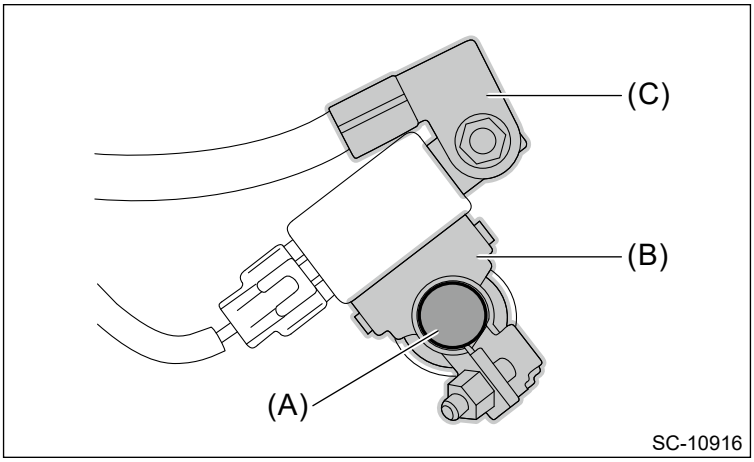
Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



3. Apply a thin coat of anti-rust grease to cover the battery terminal surface (A), connection between the battery terminal and the battery sensor (B), and connection between the ground terminal and the battery sensor (C).

Caution:
This procedure is required to prevent rust and suppress sulfation. Be careful to avoid overgreasing as it causes insulation.



STARTING/CHARGING SYSTEMS(H4DO) > Battery Sensor

INSPECTION

Check the battery sensor for deformation, cracks and any other damage.